Unclassified **ENV/EPOC/SE(98)1/FINAL**

Organisation de Coopération et de Développement Economiques
Organisation for Economic Co-operation and Development

OLIS : 08-Oct-1999
Dist. : 11-Oct-1999

English text only

ENVIRONMENT DIRECTORATE
ENVIRONMENT POLICY COMMITTEE

ENV/EPOC/SE(98)1/FINAL
Unclassified

Working Group on the State of the Environment

INDICATORS FOR THE INTEGRATION OF ENVIRONMENTAL CONCERNS INTO TRANSPORT POLICIES

English text only

82546

FOREWORD

In recent years, the debate about the environmental consequences of economic growth, and about the importance of sustainable development, has moved up the international agenda. It has been reinforced by trade liberalisation and increasing globalisation of the world economy.

However, analysing the environmental consequences of economic growth and related policies is not an easy task. Since the economic benefits of policy changes typically appear much sooner than the environmental benefits, analysing the environmental consequences must be done over a longer time frame than is required for many economic issues. The net environmental effects will, in the end, vary depending on the country's specific situation and on the policies it implements.

It is therefore essential that effective environmental policies are developed and implemented, and that environmental aspects are taken into account in economic and sectoral policy decisions.

It is further essential that these policies are based on appropriate factual information, and that the public is informed about the results of these policies. In this context, environmental indicators have proven to be powerful information and decision tools.

The OECD work programme on environmental indicators includes several sets of indicators: an OECD Core Set of environmental indicators that is common to all member countries, and various sets of indicators to integrate environmental concerns in sectoral policies (e.g. energy, transport, agriculture) that supplement the Core Set. Indicators are also derived from natural resource and environmental expenditure accounts.

The present report is one of the products of this OECD work programme on environmental indicators. It includes indicators to promote and monitor the integration of environmental concerns into transport policies. It highlights the linkages between transport trends and patterns, environmental issues and sustainable development, and thus provides a building block for sustainable development indicators.

This report was prepared by the OECD Secretariat. Its successful completion depended on personal or official contributions by individuals in Member countries, and on the work and support of the OECD Working Group on the State of the Environment. Further consultations included the OECD Working Group on Transport and the Secretariat of the European Conference of Ministers of Transport. This report is published on the responsibility of the Secretary General of the OECD.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Background

This report is part of the OECD work programme on environmental indicators and deals with transport-environment indicators. It builds upon earlier work carried out since 1990 by the OECD Working Group on the State of the Environment and, in particular, expands and updates the 1993 OECD Environment Monograph, *"Indicators for the Integration of Environmental Concerns into Transport Policies".*

It benefits from OECD experience in developing environmental indicators and in using indicators in environmental performance reviews, and provides an input to the OECD projects on environmentally sustainable transport and on sustainable development indicators.

This report has been prepared in consultation with the Secretariat of the European Conference of Ministers of Transport (ECMT) and the OECD Working Group on Transport.

Policy context

Transport is a major component of economic activity, both as a sector in itself and as a factor input to most other economic activities. It further plays an important role in the daily lives of citizens. Transport volumes depend on the demand for transport (largely determined by economic activity and transport prices) and on transport supply (e.g. the development of transport infrastructure). Other factors such as income levels, land-use patterns and access to services, trade flows, technological change, and related policy tools also play an important role.

Transport has many effects on the environment and on human health; these depend on the transport mode, its energy efficiency, the type of fuel used, and the rate of increase in related transport volumes (passenger, freight). Air pollution raises concerns mainly in urban areas where road traffic and congestion are concentrated, though transport also contributes to regional and global pollution problems such as acidification and climate change. Transport infrastructure leads to fragmentation of natural habitats; and vehicles entail waste management issues. Other negative environmental effects include noise, consumption of energy, land and other natural resources, as well as congestion and accidents.

The non-internalised costs of transport, i.e. environmental and social costs relating to pollution and accidents, impose a large cost on society. They are estimated to amount to at least five per cent of GDP for industrialised countries. Road transport and aviation are the primary contributors to this cost burden.

Experience from OECD environmental performance reviews shows that many Member countries have achieved a decoupling of economic growth from the flow of some major conventional air pollutants over the past 25 years. In the case of transport, however, measures taken so far to influence individual travel decisions often have little effect relative to the underlying growth in demand. Similarly, the benefit of technical measures to reduce vehicle emissions and noise has often been outstripped by the increase in vehicle numbers, engine size, travel frequency and trip length.

As transport is expected to increase further in a number of OECD countries, actions are needed to reduce transport-related environmental impacts and achieve long-term environmental objectives.

The integration of environmental concerns into sectoral decision-making is a key to improving environmental performance and moving towards sustainable development, as well as to cost-effectiveness in response to environmental challenges. It cannot be limited to the development or improvement of a few technologies but requires a more holistic approach including greater use of economic, regulatory and societal instruments, and of physical planning.

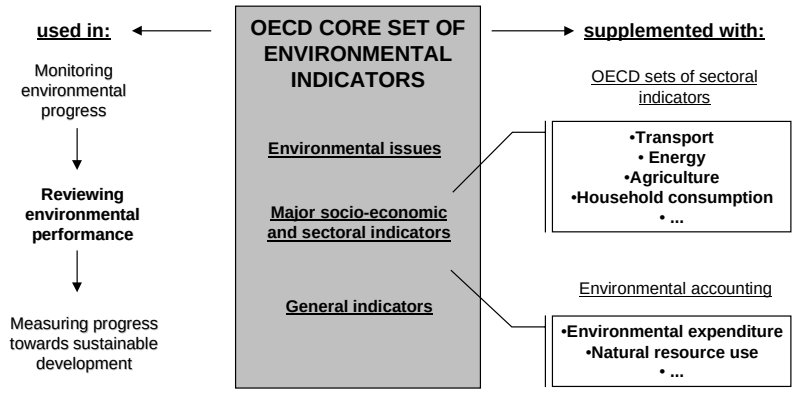
Indicator framework

PURPOSE

The indicators presented in this report are intended to promote the integration of environmental concerns into transport policies and decisions. More specific objectives are to:

- highlight the interface between transport activities and environmental issues, and identify how different driving forces and policy instruments interact and affect the environmental impacts of transport; and
- provide a basis for monitoring the integration of environmental concerns into transport policies.

Like other OECD sets of sectoral indicators, transport-environment indicators are developed in relatively large numbers. They provide a tool-kit for decision-makers and supplement the OECD Core Set of environmental indicators, which includes major core indicators.



When interpreted in context, the set of indicators can further contribute to measuring countries' progress towards more sustainable transport patterns.

STRUCTURE

The framework used for developing transport-environment indicators is that adopted for all OECD work on sectoral indicators. It is based on an adjusted pressure-state-response (PSR) model taking into account the specificities of the various sectors. The indicators are structured around three themes:

- transport trends and patterns of environmental significance (major driving forces, indirect pressures);
- interactions with the environment (direct pressures on the environment and on natural resources, related impacts);
- economic and policy aspects of the transport and environment interface (economic aspects of environmental impacts, key policy and other societal instruments, trade aspects).

SCOPE AND LIMITS

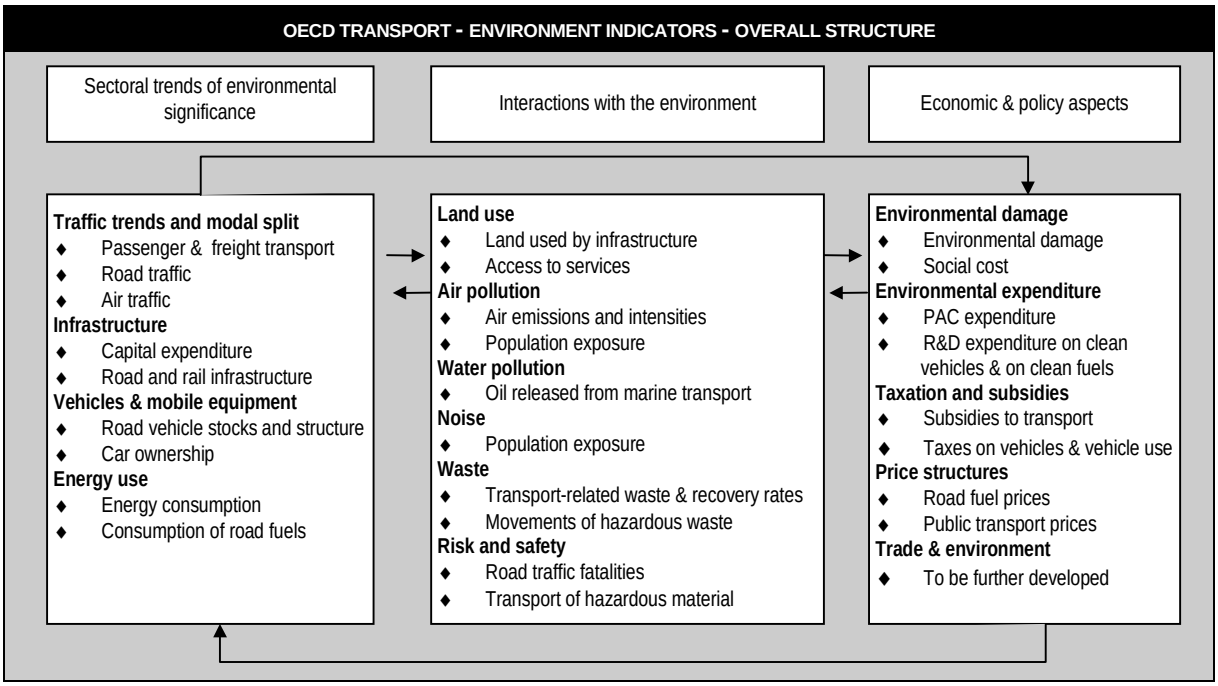
Particular attention is given to:

- the linkages between transport trends and environmental issues. Aspects other than the environment, such as social and economic aspects, are taken into account, but are not the focus,
- road transport, which is responsible for much of the transport sector's impact on the environment. Other modes are also covered, but are not the focus.
- the national level and to indicators designed to be used in an international context. Within a country a greater level of detail or breakdown may be needed. The actual measurement of indicators at these levels is encouraged and lies within the responsibility of individual countries.

None of the indicators proposed in this report is necessarily final or exhaustive in character; they may change as scientific knowledge and data availability progress.

INTERPRETATION

The indicators are not designed to provide a full picture of transport-environment relationships, but rather to help reveal trends and draw attention to phenomena or changes that require further analyses and possible action. They need thus to be supplemented with additional information and interpreted in context to acquire their full meaning.



Measured indicators

Selected indicators for which data are currently available for a majority of OECD countries are presented in Part III of this report. They include:

Traffic	–	passenger transport by mode
	–	freight transport by mode
	–	road traffic volumes and intensities
Infrastructures	–	road and rail network length and density
Vehicles	–	road vehicle stocks and intensities
	–	structure of the road vehicle fleet
Energy use	–	final energy consumption by transport - intensities and structure by mode
	–	consumption of road fuels: intensities and structure by type of fuel
Air pollution	–	transport-related air emissions and emission intensities
	–	road transport-related air emissions and emission intensities
	–	trends in CO2 emissions from transport
Risk and safety	–	road traffic accidents
Pricing and taxation	–	road fuel prices and taxes

Further work is needed to improve data availability and quality at both national and international level and to better cover social aspects.

DATA AND INTERPRETATION

The data used to calculate the indicators are from OECD sources and from other international sources. Environmental data are based on those published in "OECD Environmental Data — Compendium 1997" and in "Towards Sustainable Development — Environmental Indicators". Country replies to the 1998 OECD questionnaire on the state of the environment and related country comments have been used for further selected updates.

Interpretation of the indicators has not been attempted and is left for analysis as part of the OECD work programmes on environmental performance and on environmentally sustainable transport.

PART I. INTRODUCTION

OECD WORK ON ENVIRONMENTAL INDICATORS

MANDATE

Work on environmental indicators in the OECD has been ongoing since 1989/90. It derives its mandate from several international requests:

- In 1989, the OECD Council meeting at Ministerial level called for a next generation work programme on environmental economics that would integrate environment and economic decision-making more systematically and effectively. This was reiterated during several G-7 Economic Summits, as well as by the meeting of the OECD Environment Committee at Ministerial level in 1991.
- More specifically, a 1991 Recommendation of the OECD Council on Environmental Indicators and Information included a call for further development of "*reliable, readable, measurable and policy-relevant environmental indicators in order to contribute to [...] better integrating environmental concerns in sectoral policies such as agriculture, forestry, industry, aid, energy, transport, trade and urban policies* ...".
- A 1998 Recommendation of the OECD Council on Environmental Information asked OECD countries to further develop and use indicators to measure environmental performance, and in particular: "... *establish indicators of progress concerning the implementation of national and sub-national policies on the environment, eco-efficiency and sustainable development* ...".

PURPOSE

The OECD environmental indicators programme recognises that there is no universal set of indicators; rather, several sets exist, corresponding to specific purposes. Indicators can be used at international and national levels in state of the environment reporting, measurement of environmental performance and reporting on progress towards sustainable development. They can also be used at national level in planning, clarifying policy objectives and setting priorities.

The OECD work[1] includes several types of environmental indicators (Table 1):

- the OECD Core Set of environmental indicators, to keep track of environmental progress;
- several sets of sectoral indicators, to promote integration of environmental concerns into sectoral policy-making;
- indicators derived from environmental accounting, to promote both integration of environmental concerns into economic policies and sustainable use, and management of natural resources.

All these indicator sets are closely related to each other. The OECD Core Set represents a minimum set common to OECD countries and common to different uses and purposes. The most important sectoral indicators are thus part of the Core Set, as are major indicators derived from resource accounting.

RESULTS

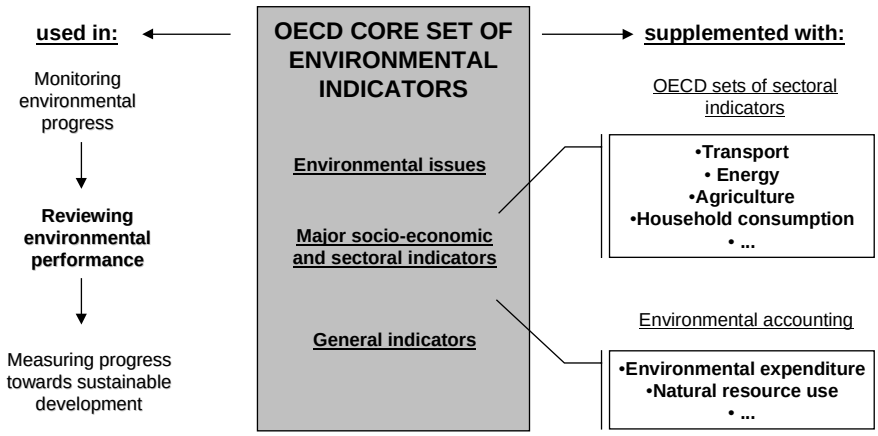
In developing harmonised international environmental indicators, OECD countries adopted a pragmatic approach, which led in particular to:

- agreement to use a common conceptual framework, based on a common understanding of concepts and definitions and on the pressure-state-response (PSR) model;
- identification of criteria to help in selecting indicators and validating their choice: all indicators are reviewed according to their policy relevance, analytical soundness and measurability (Inset 3);
- identification and definition of indicators (including an assessment of their measurability);
- provision of guidance for the use of indicators.

The results of this work, and in particular its conceptual framework, have in turn influenced similar activities by countries and international organisations (e.g the UNCSD work on sustainable development indicators).

[1] *Steered by the OECD Working Group on the State of the Environment.*

Figure 1. **OECD environmental indicators - several sets**



USES

The OECD's environmental indicators are regularly used in environmental performance reviews and in other analytical work; they are a way to monitor the integration of economic and environmental decision-making, to analyse environmental policies and to gauge environmental results. Beyond these applications, they also contribute to the broader OECD programme on sustainable development indicators.

Table 1. **OECD environmental indicators - Purpose and use**

	OECD Core Set of Environmental Indicators	Sets of sectoral indicators	Indicators derived from environmental accounting
Purpose	⇨ keep track of environmental progress (monitor state & changes and factors involved in it)	⇨ promote integration, i.e. ensure that environmental concerns are taken into account when policies are formulated and implemented	
	⇨ tool for reviewing environmental performance ⇨ tool for monitoring progress towards sustainable development		
Audience	⇨ national governments ⇨ environmental decision-makers ⇨ the public ⇨ international community	⇨ national governments ⇨ sectoral decision-makers	⇨ national governments ⇨ environmental and sectoral decision-makers
Characteristics & coverage	⇨ limited number of core indicators (around 50) ⇨ common to OECD countries ⇨ common to different users and indicator sets	⇨ large number of indicators (toolkit) ⇨ one set of indicators per sector ⇨ supplement to the OECD Core Set of environmental indicators ⇨ sectors covered: transport, energy, forestry, agriculture, household consumption	⇨ selected indicators derived from: – OECD pilot accounts (forest resources; water resources) – PAC expenditure accounts
Scope	⇨ national level indicators for use in international work ⇨ sub-national and/or further sectoral breakdown possible		
Framework	⇨ PSR model (environmental pressures, environmental conditions; society's responses) ⇨ Core issues reflecting: – environmental concerns in OECD countries – selected socio-economic and sectoral issues	⇨ policy analysis framework: adjusted PSR model (sectoral trends of environmental significance; interactions with the environment; economic and policy aspects)	⇨ accounting frameworks
Major publications	⇨ Preliminary set (1991) ⇨ Core set - synthesis report (1993) ⇨ Core Set (1994) ⇨ Core Set (1998)	⇨ Transport (1993, 1999) ⇨ Energy (1993, 1999) ⇨ Agriculture: stock-taking report by JWP (1997, 1999 forthcoming) ⇨ Household consumption (1999)	⇨ PAC expenditure (1991,93,96,99) ⇨ Natural resource accounts (1993) ⇨ Environmental accounting (1995)
	⇨ Environmental performance reviews, four to five reviews published each year since 1993		

OECD WORK ON SUSTAINABLE DEVELOPMENT INDICATORS

The objective of the OECD's three years initiative on sustainable development is to help Member countries address fundamental sustainable development issues through i) making the concept of sustainable development operational for public policies and ii) moving beyond a sectoral approach to a more integrated approach. The programme draws on ongoing OECD activities and supports related OECD work on country reviews and policy analysis[2]. It was reviewed at the 1998 and 1999 OECD Ministerial Councils, which asked for a report in 2001. To guide the programme, an OECD Round Table on Sustainable Development has been established. It gathers, in a personal capacity, Ministers of Environment and Finance (from Asia-Pacific, North America and Europe), and high-level officials from other international organisations (e.g. World Bank, World Trade Organisation, UNEP, UNCTAD, UNDP), from business and NGOs.

Sustainable development indicators can be seen as a set of indicators each of which is relevant to monitoring a particular policy concern. A more ambitious task is to develop frameworks within which the relationships of different policy goals, the links between indicators and goals and the interaction between different indicators are apparent. Work within the OECD continues on both levels with the requirement that it should lead to indicators whose quality is defensible on both conceptual and practical grounds and whose information content, and thus potential use on policy grounds, justifies the development. It builds on OECD's long-standing experience with economic, environmental and social indicators.

OECD WORK ON ENVIRONMENTALLY SUSTAINABLE TRANSPORT

The OECD has been active in the field of transport and the environment since the 1970s. The overall scope of effort directed at work on transport and environment increased from the late 1980s. In 1989, concern over the environmental impacts of transport led to the recognition by both environment and transport ministers of the need to integrate transport and environment policies[3]. Discussions about climate change and the relative contribution of transport activities to greenhouse gas emissions further added to the demand for work on transport and the environment, which has been pursued in close co-operation with the Secretariat of the European Conference of Ministers of Transport (ECMT) and the International Energy Agency (IEA).

Road transport has been identified as having by far the largest repercussions for the environment and has therefore been the focus of most of the OECD's work. In future, air transport is likely to receive greater scrutiny, given the increasingly significant impacts of this transport mode.

In 1994, the OECD initiated a project on Environmentally Sustainable Transport (EST)[4] to reconcile transport with environmental and sustainable development objectives. The project relies on the assumption that no activity can be sustainable if it surpasses the environment's long-term capacity to support it. It aims at characterising EST, developing sustainability criteria that can be quantified and have environmental significance, and establishing policy guidelines (Inset 1).

OECD Environment ministers at their meeting in Paris (2-3 April 1998) agreed on a number of shared goals for action as an expression of their commitment to sustainable development. These included the strengthening of international co-operation in meeting global and regional environmental commitments by: "... *giving particular focus to key cross-sectoral issues and the strategic directions for environmentally sustainable transport developed at the 1996 OECD Vancouver Conference[5] and the 1997 UN Economic Commission for Europe's Conference on Transport and the Environment in Vienna ...*"[6].

---

[2] It involves most OECD Directorates and close co-operation with the OECD affiliates, the International Energy Agency (IEA), the Nuclear Energy Agency (NEA), the European Conference of Ministers of Transports (ECMT) and the Development Centre. The analytical report to be presented in 2001 will look into i) the policy framework, including indicators to measure progress, ii) key policy responses to natural resource and climate change issues, and to sectoral and local issues (e.g. energy, transport, agriculture),and iii) globalisation and sustainable development.

3. ECMT, 1989, Resolution No. 66 on Transport and the Environment [CM(89)29 FINAL]

4. Project steered by the OECD Working Group on Transport.

5. OECD, 1997, Towards Sustainable Transportation – The Vancouver Conference, Paris.

6. Shared Goals for Action, document SG/COM/NEWS(98)39.

Inset 1. **The OECD project on Environmentally Sustainable Transport (EST)**

Aim and purpose

The purpose of the EST project, initiated in 1994, is to reconcile transport with environmental and sustainable development objectives. The project relies on the assumption that no activity can be sustainable if it surpasses the environment's long-term capacity to support it. It characterises EST through the use of criteria that can be quantified and have environmental significance. It also aims at providing Member countries with practical advice and policy guidelines on how to achieve EST.

The EST project attempts to demonstrate what an environmental framework for strategies to achieve EST might look like, considering environmental issues that manifest their effects at very different geographic scales (global, regional, and local). It is an attempt to establish a basis upon which a diverse range of policy-makers and economic actors can communicate and a framework within which goals, objectives, targets or standards could be set by governments and actions initiated.

- Phase 1 of the EST project, completed in 1996, involved a review of relevant activities of Member countries as well as the development of the definition of, and criteria for, EST[7].
- Phase 2 has been a scenario-development phase by participating Member countries. It has mainly comprised construction of a business-as-usual (BAU) scenario and three scenarios (technology, demand-side management, optimum combination) consistent with the EST criteria. It also involved preliminary consideration of backcasting and other analyses to be undertaken.
- Phase 3 is a backcasting phase. It mostly comprises identification of packages of policy instruments whose implementation would result in achieving the scenarios constructed during Phase 2, with a focus on one of the EST scenarios. Phase 3 also involves refinement of the scenarios developed during Phase 2 and assessment of the social and economic implications of the BAU and EST scenarios.
- Phase 4 will comprise refinement of the definition and the criteria for achieving EST and the establishment of guidelines for policy development.

Definition and criteria

EST may be qualitatively defined as the following:

"Transport that does not endanger public health or ecosystems and meets mobility needs consistent with
- *use of renewable resources at below their rates of regeneration and*
- *use of non-renewable resources at below the rates of development of renewable substitutes."*

As part of the EST project, six criteria were developed as being the minimum required to address the wide range of transport-related health and environmental impacts, such as noise, air quality, acidification, eutrophication, tropospheric ozone, climate change and land use. Waste aspects are not covered; life cycle aspects and total material requirements are being examined. The six criteria are derived from environmental quality objectives and take into account related international guidelines, standards and agreements. They relate to global, regional and local impacts and are the following:

- CO_2: total emissions from transport should not exceed 20 per cent of total CO_2 emissions in 1990,
- NOx : total emissions from transport should not exceed 10 per cent of emission levels in 1990,
- VOCs : VOCs should not exceed 10 per cent of the emission level in 1990,
- Particulates: depending on local and regional conditions, reduction of 55-99 per cent of fine particulate emissions from transport,
- Noise: 55-65 decibels during daytime and 45 decibels at night and indoors, and
- Land use: compared to 1990 levels, this criteria is likely to entail a smaller share of land devoted to transport.

It is unlikely that EST criteria will be met by technology alone. Unlike much of the current transport and environment policies, achieving EST will require greater demand-side than supply-side measures.

For further information the reader is referred to relevant OECD publications and to the OECD homepage on EST (http://www.oecd.org/env/trans)

7. *OECD, 1996, Environmental Criteria for Sustainable Transportation - Report on Phase 1 of the Project on Environmentally Sustainable Transport (EST), Paris.*

ABOUT THIS REPORT

This report is part of the OECD work programme on environmental indicators and deals with transport-environment indicators. It benefits from OECD experience in developing environmental indicators and in using indicators in environmental performance reviews, and builds upon earlier work carried out by the WGSOE. In particular, it expands and updates the 1993 OECD Environment Monograph, *"Indicators for the Integration of Environmental Concerns into Transport Policies".*

It provides an input to the OECD work programmes on i) environmental performance, ii) environmentally sustainable transport, and iii) environmental outlook and strategy, as well as to the horizontal OECD project on sustainable development indicators.

It also provides a basis for more recent international initiatives such as the Transport Environment Reporting Mechanism (TERM) for the European Union (page 24).

This report has been prepared in consultation with the Secretariat of the European Conference of Ministers of Transport (ECMT) and the OECD Working Group on Transport.

OBJECTIVES

The aim of this report is to develop and measure indicators to promote the integration of environmental concerns into transport policies and decisions. More specific objectives are to:

- highlight the interface between transport activities and environmental issues, and identify how different driving forces and policy instruments interact and affect the environmental impacts of transport*;* and
- provide a basis for monitoring the integration of environmental concerns into transport policies.

When interpreted in context, the set of indicators can further contribute to measuring countries' progress towards more sustainable transport patterns.

CONTENT

This report is in three parts:

- Part I is an introduction to the report and to related OECD work
- Part II presents the policy context and the conceptual framework for sectoral indicator development, and draws up indicators around three major themes: i) sectoral trends and patterns of environmental significance, ii) interactions with the environment, and iii) economic and policy aspects of the transport and environment interface.
- Part III presents selected indicators for which internationally comprehensive data exist.

It further includes two annexes:

- Annex I is a technical annex with data sources, notes and comments on the underlying data sets.
- Annex II includes two ECMT resolutions of relevance to the work on transport and the environment.

DATA AND INTERPRETATION

The data used to calculate the indicators are from OECD sources and from other international sources. Environmental data are based on those published in "OECD Environmental Data — Compendium 1997" and in "Towards Sustainable Development — Environmental Indicators". Country replies to the 1998 OECD questionnaire on the state of the environment and related country comments have been used for further selected updates.

The indicators are not designed to provide a full picture of transport-environment relationships, but rather to help reveal trends and draw attention to phenomena or changes that require further analyses and possible action. They need thus to be supplemented with additional information and interpreted in context to acquire their full meaning.

Interpretation of the indicators has not been attempted here and is left for analysis as part of other related OECD work programmes (e.g. environmental performance reviews).

PART II. POLICY CONTEXT AND INDICATOR FRAMEWORK

POLICY CONTEXT

BACKGROUND

Transport plays a major role in countries' economies, both as a sector in itself and as a factor input to most other economic activities. It further plays an important role in the daily lives of citizens.

The transport sector (production, maintenance, and use of transport infrastructure and mobile equipment) accounts for four to eight per cent of GDP in the economies of industrialised countries, and for two to four per cent of employment. It also has a substantial importance in international trade (in transport equipment and services), in business operating and household consumption expenditure and in public expenditure.

Various forces shape transport trends and patterns: these include economic activity and related production patterns, structural socio-demographic changes, land-use patterns, infrastructure, trade flows, technological change, and related policy tools. Social factors, including consumer behaviour and income levels also play an important role.

The volume of traffic depends on the demand for transport (determined by economic activity and transport prices) and on transport supply (e.g. transport infrastructure).

Passenger transport is closely related to household consumption and to patterns of urban sprawl which increase the dispersion of shopping, recreation and education services. It is also influenced by the time spent on leisure activities and by growth in income which has allowed people to travel more and given them more freedom to choose their mode of travel.

Freight transport is closely linked to economic activity and to patterns of production and land use. It is influenced by developments in international trade, by consumer demands and by the increasing use of modern communication technologies.

Historically, there has been a strong correlation between overall GDP growth and the expansion of the transport sector: growth of GDP has been accompanied by a roughly similar growth in transport for both passenger and goods, and by much faster growth in road transport.

TRANSPORT AND THE ENVIRONMENT

Transport plays an important role in a country's environmental performance and the sustainability of its development. It has many effects on the environment and on human health; these depend on the transport mode, its energy efficiency, the type of fuel used, and the rate of increase in related traffic volumes (passenger, freight).

Main negative environmental effects of transport activities include air pollution, noise, consumption of energy, land and other natural resources, as well as congestion and accidents which are also part of environmental concerns. However, environmental impacts are not solely caused by the operation and use of transport means, but also by the production and maintenance of vehicles, the construction of infrastructure, the provision of energy and fuel, and the disposal and decommissioning of vehicles.

Road transport is responsible for much of the transport sector's impact on the environment; it accounts for over four-fifths of all transport-related energy consumption.

Negative environmental and social externalities arising from transport impose a large cost on society. The non-internalised costs of transport, i.e. environmental and social costs relating to air pollution, noise, accidents and climate protection, are estimated to amount to at least five per cent of GDP for industrialised countries. Road transport and aviation are primarily responsible for these costs, while rail transport contributes to less than one per cent of the social cost burden[8].

More recently, concern about impacts from air traffic has been rising, due to its rapid growth particularly for private and leisure trips. Energy consumption by air transport increased by more than 50 per cent over the last two decades, partly reflecting increased deregulation and competition in the sector.

[8] *ECMT, 1998, Efficient Transport - Internalising Social Costs, European Conference of Ministers of transport (ECMT), OECD, Paris*

RESPONSES AND POLICY TOOLS

Economic forces and structural changes in major economic sectors are closely linked to environmental conditions and trends; they can thus enhance or counteract the benefits of environmental policies and technological progress. Experience from OECD environmental performance reviews shows that many Member countries have achieved a decoupling of economic growth from the flow of some major conventional air pollutants over the past 25 years. This decoupling, where it has been observed, often reflected a combination of changes in economic patterns, changes in energy intensity and mix, technological innovation and environmental policies[9].

In the case of transport, however, measures taken so far to influence individual travel decisions (e.g. fuel and road pricing, improved information provision, and various land use planning measures) often have little effect relative to the underlying growth in demand. Similarly, the benefit of technical measures to reduce vehicle emissions and noise has often been outstripped by the increase in vehicle numbers, engine size, travel frequency and trip length.

As transport is expected to increase further in a number of OECD countries, actions are needed to reduce transport-related environmental impacts and achieve long-term environmental objectives. This implies:

- some containment of the growth of traffic demand, particularly for road, but also for air transport;
- adjustments of sectoral structures: increasing the shares of more environmentally-friendly modes, and adapting fiscal charges on vehicles, vehicle fuels and the use of vehicles;
- continued technological progress to achieve quiet, clean and energy-efficient vehicles;
- developing a sound economic approach based on the polluter pays principle, reducing overall subsidies, and eliminating aspects of the structure of charges and taxes inconsistent with environmental and economic efficiency; and
- rigorous implementation of adopted legislation and measures.

POLICY INTEGRATION

The integration of environmental concerns into sectoral decision-making is a key to improving environmental performance and moving towards sustainable development, as well as to cost-effectiveness in response to environmental challenges. It cannot be limited to the development or improvement of a few technologies but requires a more holistic approach including greater use of economic and societal instruments and of physical planning.

Three levels of this integration can be outlined:

- actions concerning vehicles and motor vehicle fuels;
- actions concerning traffic management;
- actions concerning transport infrastructures.

Each level addresses specific groups of actors or decision-makers in the private and the public sector. These groups are, respectively, the:

- automobile and fuel industry and the related administrations;
- central and local transport administrations, enterprises and private households;
- public works industry and the related administrations.

These three levels of integration are reflected in the resolution on transport and environment adopted by the ECMT at a Ministerial meeting organised in co-operation with the OECD in 1989. This resolution gave recommendations to better integrate environmental concerns in transport policies, in relation to vehicles, traffic management and infrastructure (Annex 2).

More recently, the Council of the European Union, at its meeting in Cardiff (15-16 June 1998), underlined the need for integrating environmental concerns in all Community policies. It invited all relevant formations of the Council to establish their own strategies for giving effect to environmental integration and sustainable development within their respective policy areas. Progress should be monitored taking account of guidelines suggested by the European Commission and using indicators. The Transport, Energy and Agriculture Councils were invited to start this process. (see also page 24).

[9] *OECD, 1996, "Environmental Performance in OECD countries - Progress in the 1990s", Paris*

INTERNALISATION OF EXTERNAL COSTS

Internalisation of external environmental and social costs through the use of economic and regulatory instruments is an important element of policies aimed at greater integration[10]. Ministers of transport of the ECMT, at their meeting in Copenhagen (26-27 May 1998), recognised that the potential for economic instruments to address social costs has been under-exploited in most ECMT countries. They adopted a resolution on the policy approach to internalising the external costs of transport. To be effective, this approach should not discriminate between citizens or companies of different countries, nor between different modes of transport or between transport and other sectors of the economy. Furthermore, internalisation should be phased in gradually to avoid economic shocks and changes in modal split which would prove uneconomic in the longer term. The main recommendations concern taxation structures and government subsidies, as well as fuel, emissions and safety standards (Annex 2).

SOCIAL ASPECTS

Transport activities and related environmental effects interact in many ways with social aspects. On the one hand, a number of social factors act as drivers on transport trends and patterns (e.g. household consumption patterns, time spent on leisure activities, disposable income levels and distribution, patterns of urban sprawl, socio-demographic changes such as the average size of households). On the other hand:

- transport activities and mobility play an important role in the daily lives of citizens; they interact with the accessibility of leisure, education and other services, and the level of development of public transport,
- pollution, accidents and congestion cause a number of negative social side effects, which impose large costs on society. These effects and related external costs are often unevenly distributed among population groups and are not yet sufficiently taken into account in transport policies,
- transport and environmental policies and related economic instruments (e.g. taxes, subsidies, prices) may have social implications which are unevenly distributed among population and income groups.

INTERNATIONAL ASPECTS

The nature of the problems relating to the impact of transport on the environment is international for several reasons and goes far beyond the general need to harmonise policies among OECD countries:

- transport vehicles are products subject to international trade, and various standards and related regulations should not be used as non-tariff barriers to trade;
- transport vehicles contribute to the emission of air pollutants which are transported across borders or contribute to global atmospheric pollution; this is particularly significant in the cases of international aviation and maritime transport;
- transport vehicles cross borders and imply some harmonisation in fuel provision and environmental standards;
- international freight and passenger transport is influenced by the globalisation of the world economy.

Globalisation and increased competition are likely to lower transport prices across modes in most countries. Reduced prices, combined with the increased incomes that should result from more efficient transport systems generally, are likely to result in new demands for transport services. This may in turn lead to new environmental stresses in the form of noise, air pollution, habitat fragmentation and congestion. This scale effect has been exacerbated in recent years by structural shifts from the rail and shipping modes to road transport. In particular, much freight traffic that is being induced by globalisation is occurring on the road.

Scale effects from trade liberalisation will have different environmental effects in different countries; e.g. "transit" countries may suffer disproportionally from any increases in traffic volumes. On the other hand trade liberalisation may also entail positive environmental effects resulting from technological and/or structural changes in the freight sector. More open borders could allow, for example, shippers to use the most efficient routes to reach their markets, leading to fewer emissions and reduced energy consumption[11].

Examples of useful tools to better manage international road freight transport and to encourage the use of cleaner vehicles are the use of a multilateral quota system for international road transport licences which includes "green" transport licences (ECMT) and the introduction of differentiated road pricing on heavy transit corridors.

10. ECMT/OECD, 1998, Efficient Transport for Europe - Policies for Internalisation of External Costs, Paris.

11. OECD, 1997, Economic Globalisation and the Environment, Paris.

THE OECD SET OF TRANSPORT-ENVIRONMENT INDICATORS

BACKGROUND AND PURPOSE

HISTORY

An initial set of transport-environment indicators was identified at an OECD workshop in April 1990. These indicators were discussed and approved by the SOE Group in consultation with the ECMT Secretariat. A first set of indicators was published in 1993[12]; transport-environment indicators have further been part of OECD publications on environmental indicators[13]. They have also been regularly used and published in the environmental performance reviews of Member countries. Based on this experience, the set of indicators was further amended and refined.

PURPOSE

The indicators presented in this report are intended to promote the integration of environmental concerns into transport policies and decisions. More specific objectives are to:

- highlight the interface between transport activities and environmental issues, and identify how different drivers and policy instruments interact and affect the environmental impacts of transport; and
- provide a basis for monitoring the integration of environmental concerns into transport policies.

When interpreted in context, the set of indicators further contributes to measuring countries' progress towards more sustainable transport patterns.

Like other OECD sets of sectoral indicators, transport-environment indicators are developed in relatively large numbers to provide a tool-kit for decision-makers.

SCOPE AND LIMITS

The indicators are not designed to provide a full picture of transport-environment relationships, but rather to help reveal trends and draw attention to phenomena or changes that require further analyses and possible action. They need to be supplemented with additional information and interpreted in context to acquire their full meaning.

Particular attention is given to:

- the linkages between transport trends and environmental issues. Aspects other than the environment, such as social and economic aspects, are taken account of, but are not the focus,
- road transport, which is responsible for much of the transport sector's impact on the environment. Other modes are also covered, but are not the focus.
- the national level and to indicators designed to be used in an international context. Within a country a greater level of detail or breakdown may be needed, particularly when indicators are to support sub-national or sectoral decision making or when national indicators hide major regional differences. This is particularly important when dealing, for example, with indicators describing drivers which are relevant at the local level (e.g. accessibility to basic services, population density, occupancy rate of passenger cars, etc.) The actual measurement of indicators at these levels is encouraged and lies within the responsibility of individual countries.

LINKS WITH OTHER OECD INDICATOR SETS

The indicators presented in this report are closely linked to other indicator sets developed and used by the OECD:

- they supplement the OECD Core Set of environmental indicators, which includes major core indicators,
- they are closely linked to the OECD set of indicators for the integration of environmental concerns into energy policies, and
- they support the OECD set of indicators on household consumption patterns.

12. OECD, 1993, Indicators for the Integration of Environmental Concerns into Transport Policies, Paris.

13. OECD, 1994, Environmental Indicators – OECD Core Set, Paris, and OECD, 1998, Towards Sustainable Development - Environmental Indicators, Paris.

FRAMEWORK AND STRUCTURE

The framework used for developing transport-environment indicators is that adopted for all OECD work on sectoral indicators[14] (Inset 2). The indicators are structured around three themes:

- transport trends and patterns of environmental significance;
- interactions with the environment i.e. environmental impacts of the transport sector;
- economic and policy aspects of the transport and environment interface.

TRANSPORT TRENDS AND PATTERNS OF ENVIRONMENTAL SIGNIFICANCE

Environmentally significant transport trends and patterns cover major driving forces and/or indirect pressures. The proposed indicators relate to:

- overall traffic trends and modal split, including passenger and freight transport;
- transport infrastructure, including capital expenditure and network length;
- vehicles and mobile equipment, including road vehicle stocks and related structures;
- transport-related energy use.

They should further be complemented with background information on trends in GDP, on the relative importance of the transport sector in the economy and on changes in socio-demographic patterns.

INTERACTIONS WITH THE ENVIRONMENT: ENVIRONMENTAL IMPACTS OF THE TRANSPORT SECTOR

Interactions between transport and the environment cover direct pressures on the environment and on natural resources and related impacts. The proposed indicators relate to:

- transport-related resource use such as land use;
- transport-related pollutant discharges into air and water;
- transport-related waste issues
- related effects on environmental conditions such as human exposure to air pollution or to noise;
- risk and safety issues.

The indicators cover the following media or environmental issues: land, air, water, waste, noise and risks. Other issues such as the effects of transport infrastructure on ecosystems, and hence on biodiversity, are not covered, and need to be given further consideration.

ECONOMIC AND POLICY ASPECTS

This theme covers economic aspects of environmental impacts, key policy and other societal responses, as well as trade aspects. The proposed indicators relate to:

- environmental damage and social costs;
- economic instruments, including environmental expenditure, prices and taxes, subsidies;
- trade aspects such as trends in international transport of goods or the relative importance of cross-border vs. domestic transport (to be further investigated and developed).

They should further be complemented with information on regulatory and information/social instruments.

14. Sets of sectoral indicators have been developed by OECD for the integration of environmental concerns into energy, transport, and agriculture policies., as well as for household consumption

Inset 2. **Framework of OECD sets of sectoral indicators**

PURPOSE AND CHARACTERISTICS

The OECD has been developing sets of sectoral indicators to better integrate environmental concerns into sectoral policies since 1989. The objective is to develop a "tool kit" for sectoral decision-makers and to supplement the OECD Core Set of environmental indicators, which includes main core indicators. While limited to a specific sector and its interactions with the environment, these indicators are developed in relatively large numbers.

Sectoral indicator sets are not restricted to "environmental indicators" per se, but also concern linkages between the environment and the economy, placed in a context of sustainable development. They may include environmental indicators (e.g. pollutant emissions), economic indicators (e.g. sectoral output, prices and taxes, subsidies) and selected social indicators.

FRAMEWORK

The conceptual framework adopted for sectoral indicators (see below) is derived from the pressure-state-response model, but was adjusted to account for the specificities of the respective sectors. As defined by OECD countries, sectoral indicators are organised along a framework that distinguishes reflection of:

- sectoral trends and patterns of environmental significance (i.e. indirect pressures and/or related driving forces);
- interactions between the sector and the environment, including positive and negative effects of sectoral activity on the environment (i.e. direct pressures, such as pollutant releases and resource use, and related effects and resulting environmental conditions, such as ambient concentrations of pollutants and population exposure), as well as effects of environmental changes on sectoral activity;
- economic linkages between the sector and the environment, as well as policy considerations. This category includes environmental damage and environmental expenditure, economic, and fiscal instruments, and trade issues.

Sectoral trends and patterns of environmental significance	Interactions with the environment	Economic and policy aspects
Indirect pressures and/or driving forces	Sector related: • Resource use • Pollutant & waste generation • Risk and safety issues • Related effects and resulting environmental conditions • Selected direct responses	Sector related: • Environmental damage • Environmental expenditure • Taxation and subsidies • Price structures • Trade aspects

This framework is applied by the OECD to the transport and energy sectors, and to household consumption. A set of sectoral indicators is also being developed for the agricultural sector[15].

15. 🕮 *OECD (1993, 1999), Indicators for the Integration of Environmental Concerns into Transport Policies*
🕮 *OECD (1993, forthcoming), Indicators for the Integration of Environmental Concerns into Energy Policies*
🕮 *OECD (1997), Environmental Indicators for Agriculture*

PROPOSED INDICATORS

A summary view of all transport-environment indicators identified in the OECD set is presented in Table 2. The list includes both indicators which are immediately measurable (short term indicators) and indicators which would be desirable from a policy point of view, but which currently cannot be constructed due to either methodological or data problems (medium and long term indicators).

None of the indicators proposed in this report is necessarily final or exhaustive in character; they may change as scientific knowledge and data availability progress.

SELECTION CRITERIA AND EVALUATION

Indicators are reviewed according to the criteria identified by the WGSOE, i.e. policy relevance, analytical soundness and measurability (Inset 3). A first evaluation according to these three criteria is given in Table 3. The following classifications are used:

Selection criteria	Evaluation		
	1	**2**	**3**
♦ policy relevance, i.e. relevance to transport and environment policies	High	Medium	Low
♦ analytical soundness	Good	Average	Poor
♦ measurability, taking into account:			
– data availability	Short term	Medium term	Long term
– data quality including international comparability	Good	Average	Poor

Those indicators for which data are currently available for a majority of OECD countries have been calculated and are presented in Part III of this report. The relevance of the indicators to the OECD project on environmentally sustainable transport is mentioned where applicable.

OTHER INTERNATIONAL WORK - THE EU TRANSPORT AND ENVIRONMENT REPORTING MECHANISM

In line with the conclusions of the Cardiff and Vienna Summits, the European Commission (DG XI, DG VII and Eurostat), with the support of the European Environment Agency (EEA), has initiated in 1998[16] the development of an indicator-based transport and environment reporting mechanism (TERM)[17].

Inset 3. **Criteria for selecting environmental indicators**

Policy relevance and utility for users

An environmental indicator should:

- provide a representative picture of environmental conditions, pressures on the environment or society's responses;
- be simple, easy to interpret and able to show trends over time;
- be responsive to changes in the environment and related human activities;
- provide a basis for international comparisons;
- be either national in scope or applicable to regional environmental issues of national significance;
- have a threshold or reference value against which to compare it, so that users can assess the significance of the values associated with it.

Analytical soundness

An environmental indicator should:

- be theoretically well founded in technical and scientific terms;
- be based on international standards and international consensus about its validity;
- lend itself to being linked to economic models, forecasting and information systems.

Measurability

The data required to support the indicator should be:

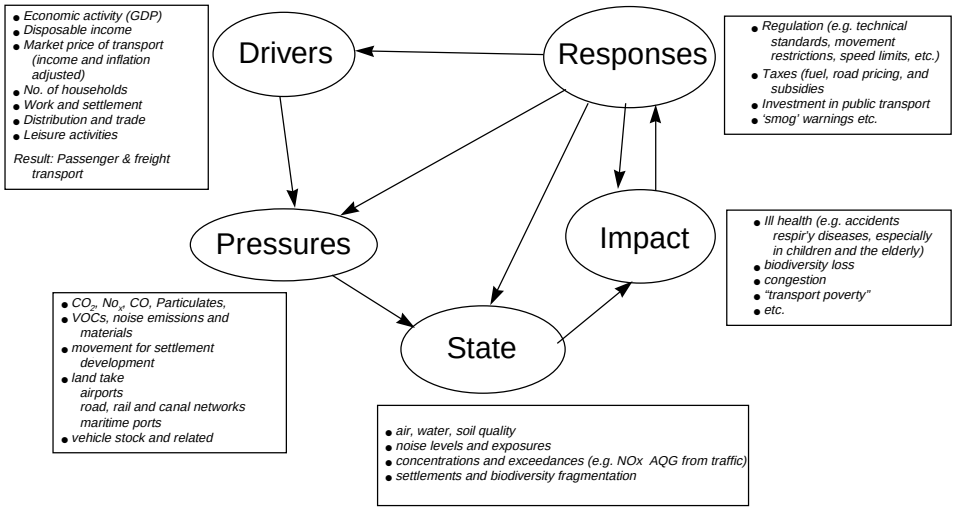
- readily available or made available at a reasonable cost/benefit ratio;
- adequately documented and of known quality;
- updated at regular intervals in accordance with reliable procedures.

**These criteria describe the "ideal" indicator; not all of them will be met in practice.*

TERM is tailored to the specific needs of EU transport policy-making. It aims at monitoring and assessing the effectiveness of integration measures at EU level and at supporting the development of a sustainable transport system. The geographical coverage of TERM is confined to the 15 EU Member States with a possible extension to EU accession countries and to countries of the UN/ECE Region.

The reporting framework used for TERM is based on a further breakdown of the PSR model, distinguishing Driving forces, Pressures, State, Impact and Responses (DPSIR). Indicators are structured according to the following issues: - environmental consequences of transport; - land use and access; - transport demand and intensity; - transport supply; - price signals; and - transport efficiency.

Inset 4. **Reporting framework for the EU Transport-Environment Reporting Mechanism**



PROSPECTS AND FUTURE WORK

The OECD experience shows that environmental indicators are cost-effective and powerful tools for tracking and charting environmental progress and measuring environmental performance. However, experience also shows significant lags between the demand for indicators, the related conceptual work and the actual capacity for mobilising and validating underlying data. In the field of environmental statistics, differences among countries may be considerable and the establishment of reliable and internationally comparable data calls for continuous monitoring, analysis, treatment and checking.

All indicators are viewed in a dynamic context: they are not necessarily final in character, and may change as analytical knowledge and related work in other international fora progresses. The indicator set is also expected to evolve in response to the needs of the OECD programme on environmental performance and of the OECD-wide programme on sustainable development.

Progress is particularly needed in:

- improving the coverage, quality and comparability of the indicators and related basic data sets;
- linking the indicators more closely to established policy goals and sustainability issues.

Examples of areas not yet or not sufficiently covered are economic aspects (e.g. social cost, expenditure, taxes, subsidies), social aspects (e.g. access to basic transport and other services, population exposure to pollution and nuisances, consumer behaviour and opinions, household expenditure on transport compared to disposable income), trade and international dimensions, non-motorised transport (e.g. cycling, walking), and effects on biodiversity (e.g. habitat fragmentation).

This necessitates greater policy relevance and increased quality and timeliness of basic data sets, as well as a closer link between environmental data and existing economic and social information systems.

Table 2. **OECD indicators for the integration of environmental concerns into transport policies**
Summary table

SECTORAL TRENDS AND PATTERNS OF ENVIRONMENTAL SIGNIFICANCE	INTERACTIONS WITH THE ENVIRONMENT	ECONOMIC AND POLICY ASPECTS
A. Overall traffic trends & modal split ♦ Passenger transport trends by mode ♦ Freight transport trends by mode ♦ Road traffic trends and densities (passenger, goods) ♦ Trends of airport traffic: number of movements	**E. Land use** ♦ Change in land use by transport infrastructures ♦ Accessibility of basic services	**K. Environmental damage** ♦ Environmental damage relating to transport ♦ Social cost of transport
B. Infrastructure ♦ Capital expenditure: total and by mode ♦ Road network: length and density ♦ Rail network: length and density	**F. Air pollution** ♦ Transport emissions - CO_2, NOx, VOC, CO, etc. (share in total, by mode) and emissions intensities (per capita, per vehicle km, per GDP) ♦ Population exposed to air pollution from transport	**L. Environmental expenditure** ♦ Total expenditure on pollution prevention and clean-up ♦ R&D expenditure on "eco-vehicles" ♦ R&D expenditure on clean transport fuels
C. Vehicles and mobile equipment ♦ Road vehicle stocks (passenger, goods) ♦ Structure of road vehicle fleet (by type of fuel, by age classes, share of "clean" vehicles) ♦ Private car ownership	**G. Water pollution** ♦ Oil released from marine transport (through accidents and discharges during current operations)	**M. Taxation and subsidies** ♦ Direct subsidies ♦ Total economic subsidies (direct & indirect subsidies, plus externalities) ♦ Relative taxation of vehicles and vehicle use (including road tolls)
D. Energy use ♦ Final energy consumption by the transport sector (share in total, per capita, by mode) ♦ Consumption of road fuels (total, per vehicle-km, by type: diesel, gasoline, other)	**H. Noise** ♦ Population exposed to transport noise greater than 65 dB(A)	**N. Price structure** ♦ Structure of road fuel prices in real terms (by type of fuel) ♦ Trends in public transport prices in real terms
	I. Waste ♦ Transport-related waste and related recovery rates ♦ Hazardous waste, imported or exported (tonnes)	**O. Trade and environment** ♦ Indicators to be developed (e.g. trends in international transport of goods, relative importance of cross-border vs. domestic transport)
	J. Risk and safety ♦ Road traffic fatalities (number of people killed or injured, per veh.km) ♦ Hazardous materials transported by mode (tonne-km)	

Legend: : Indicators measured and presented in Part III of this report.

Source: Table based on the OECD Environment Monograph [OCDE/GD(93)150], *"Indicators for the Integration of Environmental Concerns into Transport Policies",* Paris, 1993, and on OECD Environmental Performance Reviews.

Table 3. **Evaluation of the proposed indicators**

	Policy relevance	Analytical soundness	Measurability	
			Data availability	Data quality
SECTORAL TRENDS AND PATTERNS OF ENVIRONMENTAL SIGNIFICANCE				
A. Overall traffic trends and modal split				
♦ Passenger transport trends by mode	1	1	2	2/3
♦ Freight transport trends by mode	1	1	2	2/3
♦ Road traffic trends and densities	1	1	1/ 2	2
♦ Trends of airport traffic	2	1	1/ 2	1
B. Infrastructure				
♦ Capital expenditure by mode	1	2	1	2
♦ Road network length and density	1	1	1	1
♦ Rail network length and density	1	1	1	1
C. Vehicles and mobile equipment				
♦ Road vehicle stocks	1	1	1	1
♦ Structure of road vehicle fleet	1	1	2	2
♦ Private car ownership	1	1	1	1
D. Energy use				
♦ Final energy consumption by the transport sector	1	1	1	1
♦ Consumption of road fuels	1	1	1	1
INTERACTIONS WITH THE ENVIRONMENT				
E. Land use				
♦ Change in land use by transport infrastructure	1	1	2	2/3
♦ Access to basic services	1	2	3	3
F. Air pollution				
♦ Transport emissions and emission intensities	1	1	2	2
♦ Population exposed to air pollution from transport	1	1	2	2/3
G. Water pollution				
♦ Oil released from marine transport	1	1	2	2
H. Noise				
♦ Population exposed to transport noise ≥ 65db(A)	1	1	2	2/3
I. Waste				
♦ Transport-related waste and related recovery rates	1	1	2	-
♦ Hazardous waste imported or exported	1	1	2	2
J. Risk and safety				
♦ Road traffic fatalities	1	1	1	2
♦ Hazardous material transported by mode	1	1	2	-
ECONOMIC AND POLICY ASPECTS				
K. Environmental damage				
♦ Environmental damage relating to transport	1	1	3	3
♦ Social cost of transport	1	1	3	3
L. Environmental expenditure				
♦ Total expenditure on pollution prevention and clean-up	1	2	2	-
♦ R&D expenditure on "eco-vehicles"	1	2	3	-
♦ R&D expenditure on clean transport fuels	1	2	3	-
M. Taxation and subsidies				
♦ Direct subsidies to transport	1	2	3	-
♦ Total economic subsidies to transport	1	2	3	-
♦ Relative taxation of vehicles and vehicle use	1	2	2	-
N. Price structures				
♦ Structure of road fuel prices	1	1	1	1
♦ Trends in public transport prices	1	2	3	3
O. Trade and environment				
♦ Indicators to be developed (e.g. trends in international transport of goods, relative importance of cross-border vs. domestic transport)	2	2	2	-

Legend: [ ] : Indicators measured and presented in Part III of this report.

PART III.
MEASURED INDICATORS - SELECTED TRENDS

DATA SOURCES

The indicators presented in this part of the report are those for which data are currently available for a majority of OECD countries. The data used to calculate the indicators are from OECD and ECMT sources and from other international sources. Environmental data largely come from "OECD Environmental Data - Compendium 1997" and from "Towards Sustainable Development – Environmental Indicators". These data are harmonised through the work of the OECD Working Group on the State of the Environment (WGSOE). Some were updated or revised on the basis of comments from SOE Delegates, as received by January 1999.

COMPARABILITY

In many countries, systematic collection of environmental data has a short history; sources are typically spread across a range of agencies and levels of government, and information is often collected for other purposes. When reading this report, one should therefore keep in mind that definitions and measurement methods may vary among countries and that inter-country comparisons require great caution.

Concerning transport data, the joint work carried out by the Intersecretariat Working Group on Transport Statistics set up by the ECMT, Eurostat, and UN/ECE Secretariats, is expected to help further improving and harmonising international transport statistics.

Data sources, notes and comments can be found in Annex 1. "Measured indicators - Technical Annex".

INTERPRETATION

One should note that indicators are only one tool. They help reveal trends and draw attention to phenomena or changes that require further analyses and possible action. Thus, they need to be supplemented with additional information and interpreted in context to acquire their full meaning.

No attempt has been made to suggest interpretations of the indicators presented in this report. This is a deliberate choice. Interpretation is left for analysis as part of the OECD programmes on environmental performance reviews and on environmentally sustainable transport.

TRAFFIC

POLICY RELEVANCE

Traffic levels and trends are fundamental determinants of pressure on the environment exerted by transport. The amount of traffic depends on the demand for transport (largely determined by economic activity and transport prices) and on transport supply (e.g. the development of road infrastructure). Historically, there has been a strong correlation between overall GDP growth and the expansion of the transport sector: growth of GDP has been accompanied by a roughly similar growth in transport for both passenger and goods, and by much faster growth in road transport.

Passenger transport is closely related to household consumption and to patterns of urban sprawl which increase the dispersion of shopping, recreation and education services. It is also influenced by the time spent on leisure activities and by growth in income, which has allowed people to travel more and given them more freedom to choose their mode of travel.

Freight transport is closely linked to economic activity and to patterns of production and land use. It is influenced by developments in international trade, by consumer demands and by the increasing use of modern communication technologies.

The environmental effects of traffic depend on the transport mode, its energy efficiency, the type of fuel used and the rate of increase in related traffic volumes (passenger, freight). Changes in the modal split of transport are thus important determinants of the efficiency of environmental and transport policies. Road traffic accounts for many of the environmental implications: an increase in road traffic volumes generally translates into increased atmospheric pollution, noise, accidents, congestion and consumption of energy resources. Concern about impacts from air traffic is rising, due to its rapid growth particularly for private and leisure trips.

THE INDICATORS

The indicators presented here relate to:

- Passenger transport by mode expressed in passenger-km. Data cover the following modes: railways, private cars and taxis, and buses and coaches. Data on other transport modes including air traffic or cycling and walking need further development.
- Freight transport by mode expressed in tonne-km. Data cover the following modes: rail, road and inland waterways. Pipelines are not included. Data on air traffic need further development.
- Road traffic volumes and intensities and related changes over time. Volume data are expressed in annual vehicle-km; they cover total traffic as well as traffic by passenger cars and traffic by goods vehicles. Traffic intensities are expressed:
  - per unit of GDP (vehicle-km/US$ of GDP),
  - per capita (vehicle-km/capita), and
  - per unit of road network length.

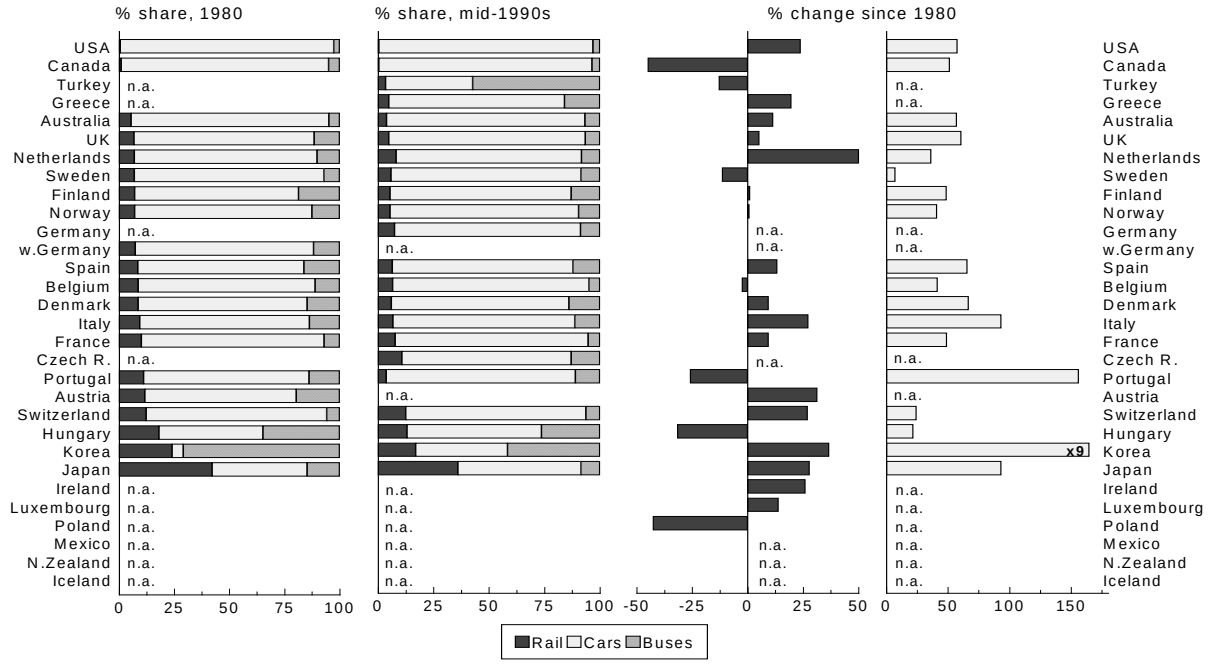
These indicators should be read in connection with other transport indicators (infrastructure, vehicle stocks), with transport-related energy indicators (energy consumption, prices and taxes) and with indicators on the social cost of transport.

They should further be complemented with data on: the average occupancy of passenger vehicles, the average load factor of goods vehicles, the relative share of public transport in passenger traffic, and the importance of i) air traffic for both passenger and freight transport, ii) combined freight transport, and iii) non-motorised transport modes. Other useful information at local level includes the accessibility of leisure, education and other services.

A distinction between domestic and cross-border traffic would be useful for a number of countries, as well as information on sub-national differences.

TRAFFIC

Passenger transport by mode

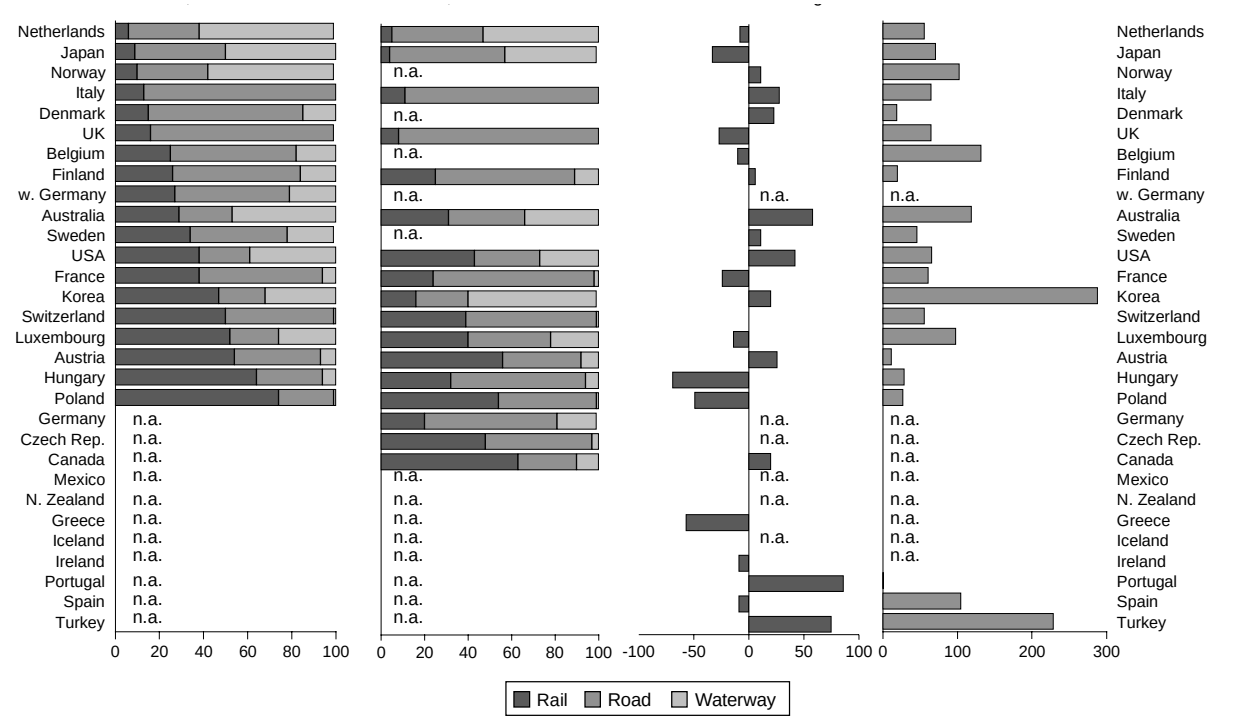


		Transport structure share(a) of total (%)						Transport volume (billion passenger-km)			Change (%)		
		1980			mid-1990s			mid-1990s			1980 - mid-1990s		
		Rail	Road: cars	Buses & coaches	Rail	Road: cars	Buses & coaches	Rail	Road: cars	Buses & coaches	Rail	Road: cars	Buses & coaches
Canada		1	94	5	-	96	4	1	392	14	-45	51	4
Mexico		..	..	..	..	..	..	2	..	0.4	..	..	..
USA	*	-	97	3	-	97	3	22	6421	204	24	57	86
Japan		42	43	15	36	56	8	402	620	95	28	93	-14
Korea		24	5	71	17	41	42	30	72	73	37	1480	14
Australia		5	90	5	4	90	7	10	230	17	11	57	116
N. Zealand	*	..	..	..	..	..	..	..	..	..	..	..	..
Austria		12	69	20	..	..	..	10	..	..	31	..	..
Belgium	*	9	80	11	7	89	5	7	92	5	-2	41	-43
Czech Rep.		..	..	..	11	76	13	8	58	10	..	..	..
Denmark		9	77	15	6	80	14	5	64	11	9	67	51
Finland		7	74	19	5	82	13	3	50	8	1	49	-6
France		10	83	7	8	87	5	60	674	41	9	49	8
Germany		..	..	..	7	84	9	65	748	77	..	..	..
w. Germany	*	7	81	12	..	..	..	..	..	..	..	..	..
Greece		..	..	..	5	79	16	2	28	6	20	..	-2
Hungary		18	47	35	13	61	26	9	44	19	-32	22	-28
Iceland		..	..	..	..	..	..	..	..	..	..	..	..
Ireland		..	..	..	..	..	..	1	..	..	26	..	..
Italy		9	77	14	7	82	11	50	626	87	27	93	50
Luxembourg		..	..	..	..	..	..	0.3	..	..	14	..	..
Netherlands		7	83	10	8	84	8	14	146	15	58	36	10
Norway		7	80	13	5	85	10	3	44	5	1	41	2
Poland		..	..	..	..	..	..	27	..	32	-43	..	-35
Portugal		11	75	14	4	85	11	5	105	14	-26	156	78
Spain		9	75	16	6	82	12	17	216	32	13	65	15
Sweden		7	86	7	6	86	9	6	93	9	-12	7	27
Switzerland		12	82	6	12	81	6	12	76	6	27	24	33
Turkey		..	..	..	3	39	57	5	63	92	-13	..	..
UK		7	82	12	5	89	7	32	589	44	5	60	-15

** See Annex 1 for data sources, notes and comments.*

TRAFFIC

Freight transport by mode

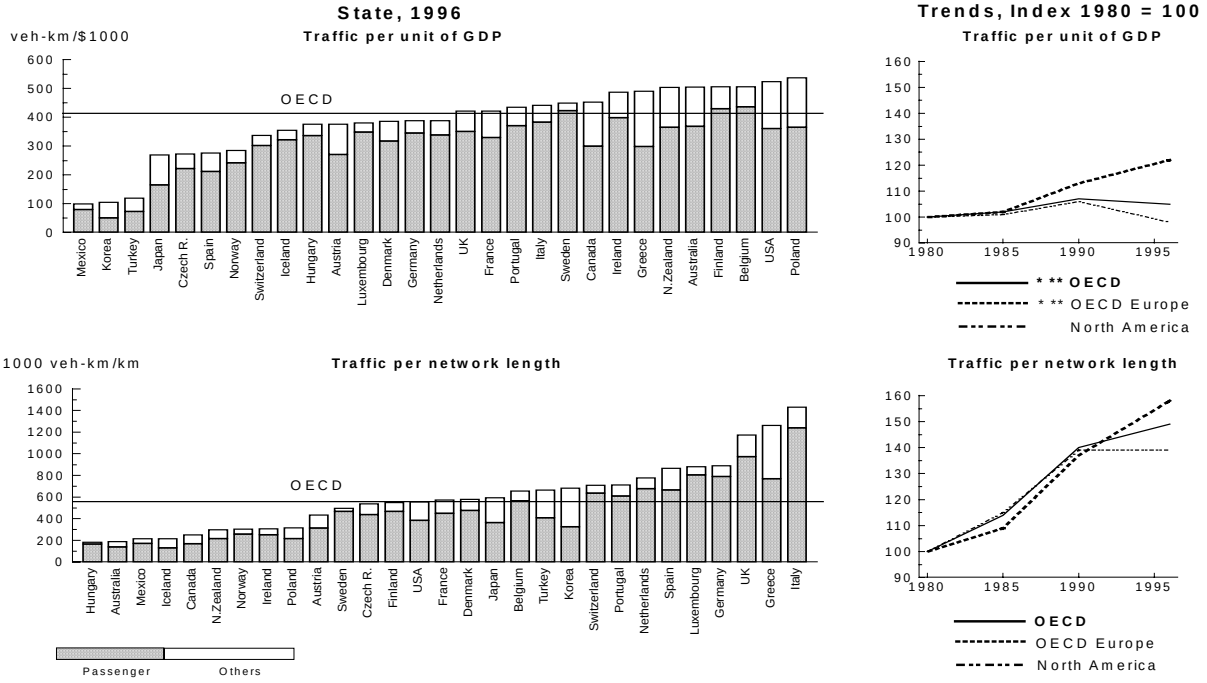


		Transport structure share(a) of total (%)						Transport volume billion tonne-km			% change		
		1980			mid-1990s			mid-1990s			1980 - mid-1990s		
		Rail	Road	Inland water	Rail	Roads	Inland water	Rail	Roads	Inland water	Rail	Roads	Inland water
Canada	*	..	..	..	63	27	10	282	121	42	20	..	..
Mexico		..	..	..	..	..	..	42	..	..	..	..	..
USA	*	38	23	40	43	30	27	2303	1624	1424	42	66	-17
Japan	*	9	41	51	4	53	42	25	306	242	-33	71	9
Korea	*	47	21	32	16	24	59	13	19	46	20	288	522
Australia		29	24	48	31	35	34	100	114	109	58	119	4
N. Zealand		..	..	..	..	..	..	..	..	..	..	..	..
Austria		54	39	8	56	36	8	14	9	2	26	12	35
Belgium		25	57	18	..	..	..	7	43	..	-10	132	..
Czech Rep.		..	..	..	48	49	3	22	23	1	..	..	..
Denmark		15	70	15	..	..	..	2	9	..	23	19	..
Finland		26	58	16	25	64	11	9	22	4	6	20	-30
France	*	38	56	6	24	74	3	51	158	6	-24	61	-47
Germany		..	..	..	20	61	18	68	204	61	..	..	..
w. Germany		27	52	21	..	..	..	..	..	..	..	..	..
Greece		..	..	..	..	..	..	0.4	13	..	-57	..	..
Hungary		64	30	6	32	62	6	8	15	1	-69	29	-38
Iceland		..	..	..	..	..	..	..	..	..	..	..	..
Ireland		..	..	..	..	..	..	1	..	..	-9	..	..
Italy		13	87	0	11	89	0	23	198	0.2	28	65	18
Luxembourg		52	22	26	40	38	22	1	1	0.3	-14	98	-3
Netherlands		6	32	61	5	42	53	3	28	35	-8	56	6
Norway		10	32	57	..	..	..	2	11	..	11	103	..
Poland		74	25	1	54	45	1	68	57	1	-49	27	-63
Portugal		..	..	..	..	..	..	2	12	..	86	1	..
Spain		..	..	..	..	..	..	10	183	..	-9	105	..
Sweden		34	44	21	..	..	..	18	31	..	11	46	..
Switzerland		50	49	1	39	60	1	7	11	0.2	-0.1	56	45
Turkey		..	..	..	..	..	..	9	124	..	75	229	..
UK		16	83	0	8	92	0	13	150	0.2	-27	65	-50

** See Annex 1 for data sources, notes and comments.*

TRAFFIC

Road traffic volumes and intensities: total motor vehicles

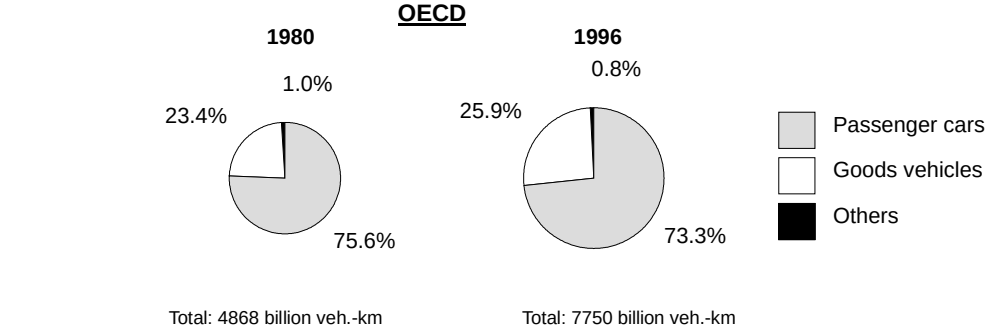


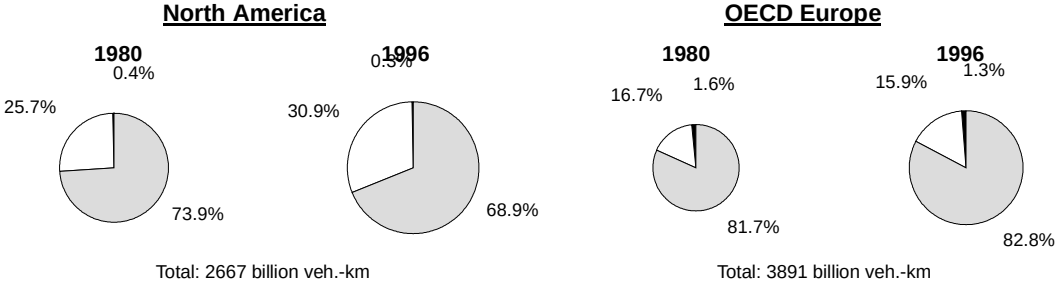
		Total volume of traffic (a)			Intensity per unit of GDP			Intensity per capita			Density per network length		
		billion veh-km	% change		veh-km/ 1000$	% change		10^3v.km/cap.	% change		10^3 v-km/ km	% change	
		1996 (b)	'70-'80	'80-'96	1996	'70-'80	'80-'96	1996	'70-'80	'80-'96	1996	'70-'80	'80-'96
Canada		267	63	30	452	7.2	-9.7	8.9	41	7	253	48	13
Mexico		54	23	27	99	-34.9	-2.6	0.6	-9	-8	173	-59	-13
USA	*	3570	35	48	524	-0.4	-2.6	13.4	22	27	556	30	43
Japan	*	690	72	77	270	11.6	7.3	5.5	53	65	595	57	70
Korea		57	59	554	105	-23.4	79.2	1.3	35	448	683	50	268
Australia		172	45	50	506	4.5	-8.3	9.4	27	20	188	59	33
N. Zealand		27	25	66	503	7.4	12.9	7.5	12	43	297	23	68
Austria		56	61	58	376	13.1	12.2	6.9	60	48	434	43	30
Belgium		95	38	107	507	-0.3	58.8	9.3	35	100	657	3	82
Czech Rep.	*	30	10	42	273	..	..	2.9	5	42	538	10	44
Denmark		42	14	58	386	-8.5	11.3	7.9	10	54	580	4	52
Finland		43	39	60	506	-2.0	16.4	8.4	34	49	550	34	54
France	*	468	50	58	422	8.5	16.7	8.0	42	46	575	48	56
Germany		563	..	..	389	..	..	6.9	..	..	890	..	..
w. Germany	*	500	45	50	383	11.2	9.8	7.6	43	40	..	31	..
Greece	*	52	122	156	491	40.3	100.7	5.0	103	136	1262	110	130
Hungary		29	144	53	375	..	..	2.9	136	63	184	174	-16
Iceland	*	2	25	98	356	-32.4	38.6	6.6	12	68	143	13	99
Ireland		28	72	53	487	8.5	-23.4	7.8	50	44	307	62	53
Italy	*	453	55	100	441	9.0	50.7	7.9	48	96	1430	48	88
Luxembourg		5	46	105	380	13.3	-1.4	10.9	36	80	880	42	102
Netherlands	*	108	46	54	389	9.1	8.3	7.0	34	40	778	32	20
Norway		28	73	46	285	8.7	-8.6	6.4	64	37	305	53	31
Poland		119	238	166	537	..	..	3.1	209	145	316	234	112
Portugal		49	127	129	435	42.9	52.7	5.0	100	127	712	83	72
Spain	*	147	101	108	276	42.1	41.6	3.7	82	98	866	86	85
Sweden	*	69	28	55	451	5.4	22.4	7.8	24	45	498	24	45
Switzerland		51	36	40	336	12.4	15.0	7.1	33	26	711	23	31
Turkey	*	41	142	178	120	62.3	33.1	0.7	94	97	666	140	170
UK	*	436	35	81	422	11.6	24.7	7.4	33	73	1173	28	65
North America		3891	37	46	490	-2.3	-2.3	9.9	18	20	500	28	38
OECD Europe	*	2912	51	74	393	..	22.3	5.7	42	61	721	43	58
EU-15	*	2614	48	72	408	..	24.3	7.0	42	64	814	39	61
OECD	*	7750	44	59	411	..	*4.9*	7.1	30	40	551	37	48

** See Annex 1 for data sources, notes and comments.*

TRAFFIC

Road traffic volumes and intensities: passenger cars and goods vehicles



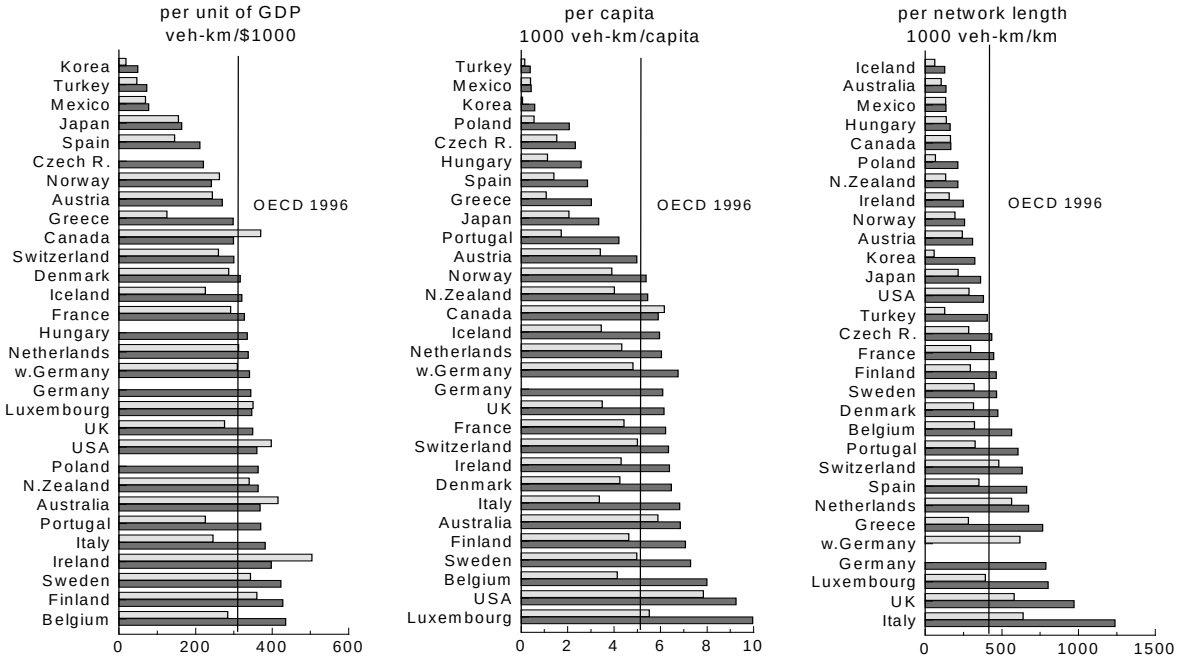


		Passenger car traffic (a)							Goods vehicles traffic						
		Traffic volume				Intensities per capita			Traffic volume				Intensities per unit of GDP		
		billion veh-km	% Change		share of total	10^3 veh-km/cap.	% Change		billion veh-km	% Change		share of total	veh-km/$10^3$$	% Change	
		1996 (b)	'70-'80	'80-'96	1996	1996(b)	'70-'80	'80-'96	1996(b)	'70-'80	'80-'96	1996	1996(b)	'70-'80	'80-'96
Canada		177	51	16	66	5.9	30	-4	90	116	72	34	153	42	19
Mexico		43	26	48	80	0.4	-8	7	11	19	-15	20	20	-37	-35
USA		2460	25	37	69	9.3	12	18	1100	79	78	31	162	32	17
Japan	*	421	100	74	61	3.3	78	62	262	41	85	38	103	-8	12
Korea		27	94	868	48	0.6	64	710	26	18	651	46	49	-43	106
Australia		126	37	45	73	6.9	20	16	44	69	71	26	130	21	4
N. Zealand		20	23	57	72	5.5	11	36	7	25	99	25	128	7	36
Austria		40	66	56	72	5.0	64	46	15	52	67	27	103	6	19
Belgium		81	42	99	86	8.0	39	93	6	13	35	6	33	-18	3
Czech Rep.		24	14	51	81	2.3	8	51	4	10	13	13	34	..	..
Denmark		34	10	56	82	6.5	6	52	7	40	64	17	64	12	16
Finland		36	60	63	85	7.1	54	52	6	18	51	14	70	-16	10
France	*	364	45	52	78	6.2	37	41	101	72	83	22	91	24	35
Germany		500	..	..	89	6.1	..	..	60	..	..	11	41	..	..
w. Germany	*	447	48	50	89	6.8	46	40	51	26	51	10	39	-3	11
Greece	*	32	138	203	61	3.0	117	179	20	118	134	38	187	38	84
Hungary		26	172	112	89	2.6	163	126	3	84	-43	11	40	..	..
Iceland		2	37	103	90	6.0	24	72	0.1	-34	60	7	26	-64	12
Ireland		23	87	58	82	6.4	62	48	5	32	37	17	83	-17	-31
Italy	*	393	56	106	87	6.8	48	103	55	46	67	12	54	3	26
Luxembourg		4	52	106	91	10.0	42	81	0.3	4	76	7	28	-19	-15
Netherlands		94	64	53	87	6.1	51	40	14	48	61	12	49	11	14
Norway		24	81	47	85	5.4	72	38	4	97	115	15	43	24	34
Poland		81	404	293	68	2.1	361	262	33	182	61	28	149	..	..
Portugal		42	139	146	85	4.2	111	143	6	94	57	13	57	22	4
Spain	*	113	115	113	77	2.9	95	103	32	57	95	22	60	11	33
Sweden	*	65	29	56	94	7.3	25	46	4	9	74	6	27	-10	38
Switzerland		45	37	41	89	6.4	35	27	5	26	42	11	36	4	16
Turkey	*	25	209	224	61	0.4	147	130	13	111	119	32	38	42	5
UK	*	362	40	83	83	6.2	38	76	70	19	69	16	67	-2	17
North America		2680	26	36	69	6.8	9	12	1201	80	75	31	151	28	18
OECD Europe		2410	53	76	83	4.8	43	63	463	47	66	16	63	..	..
EU-15		2184	51	73	84	5.9	44	65	401	41	69	15	63	..	..
OECD		5683	39	54	73	5.2	25	36	2004	65	76	26	106	..	..

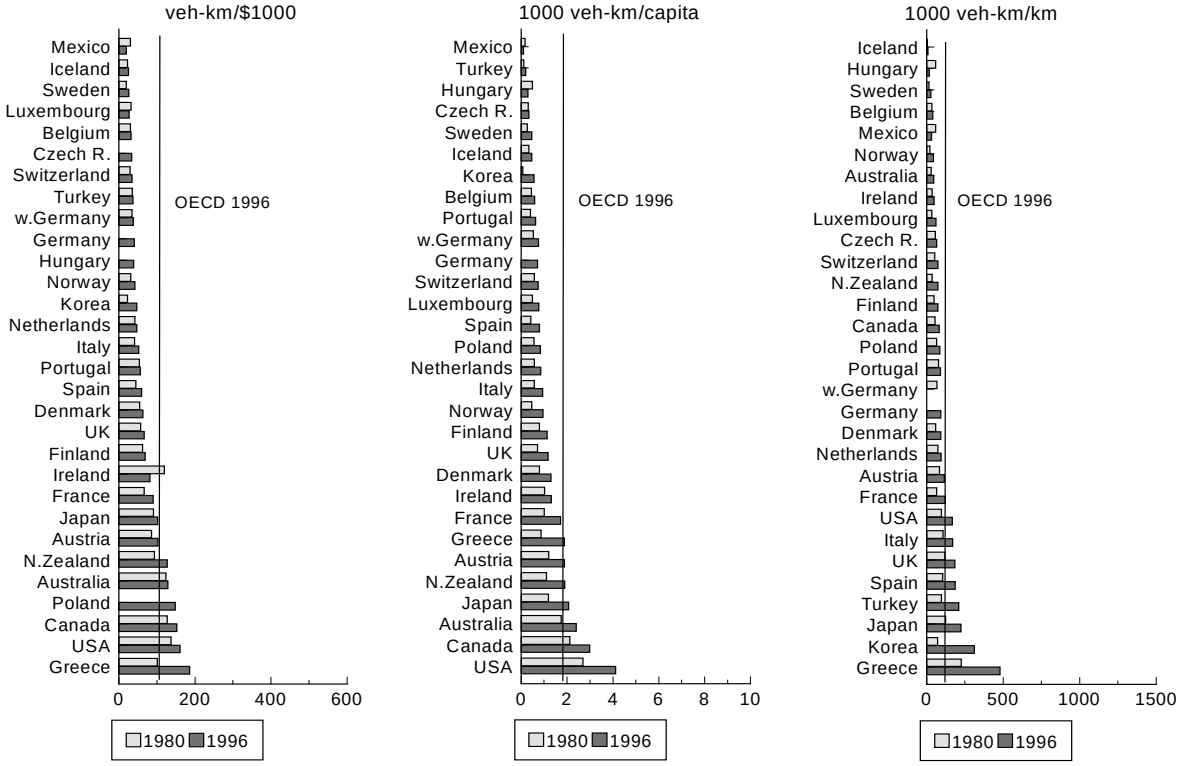
** See Annex 1 for data sources, notes and comments.*

TRAFFIC

Road traffic intensities: passenger cars



Road traffic intensities: goods vehicles



INFRASTRUCTURES

POLICY RELEVANCE

The amount of traffic depends on the demand for transport and on transport supply. Recent studies show a clear link between the development of transport infrastructures and increases in traffic volumes, particularly in the case of road transport (infrastructure-induced mobility).

The capacity of transport infrastructure, their accessibility and geographical distribution play an important role in the modal split of transport. The development of an efficient combined transport network for commercial freight traffic, for example, requires adequate and compatible infrastructure facilities as well as appropriate terminal capacities.

Decisions concerning transport infrastructures are closely related to land use planning, to local economic development, access to basic services, and to trade flows. Environmental concerns can best be taken into account through integration in the early phases of decision-making, and through appropriate environmental impact assessment procedures (including consultation and participation of the public).

Growing mobility, its environmental effects and related external costs, raise questions as to what priority should be given to infrastructure development as opposed to alternative policies such as improved traffic control, more efficient time and space management on existing infrastructure, more rational use of vehicles and better control of demand.

Transport infrastructures exert pressures on the environment through the consumption of space and the physical transformation of the environment. Land use for transportation is often perceived to be a key issue in that it is both a factor generating transport activity (infrastructure induced mobility) and a contributor to environmental stress (e.g. impermeability of the ground, fragmentation of natural habitats). Land used for transport infrastructure (e.g. road, railways and associated facilities) may further be in conflict with other land uses and also influence access and property values. Transport infrastructure is estimated to consume about 25-30 per cent of land in urban areas and less than 10 per cent in rural areas. However, these proportions do not include land used for auxiliary transport purposes such as parking, manufacturing and maintenance facilities.

When the capacity of road infrastructure remains “insufficient” compared to the increase in traffic volumes, this can lead to higher congestion and safety problems. It also affects the average fuel efficiency of road vehicles and hence traffic related air emissions.

Sustainable action in the transport sector requires integration of land use and transport planning. The OECD project on environmentally sustainable transport identifies land used by transport as one of its six sustainability criteria.

THE INDICATORS

The indicators presented here focus on road and rail infrastructure and relate to:

- Road network length and density in km and per unit area of national territory. The density of the road network gives a rough indication of the space consumed by road infrastructure. Land used for auxiliary (road) transport purposes such as parking also plays a role, but is more difficult to quantify.
- Motorways length and density expressed in km and per unit area of national territory.
- Rail network length and density expressed in km and per unit area of national territory, as well as the share of electrified routes.

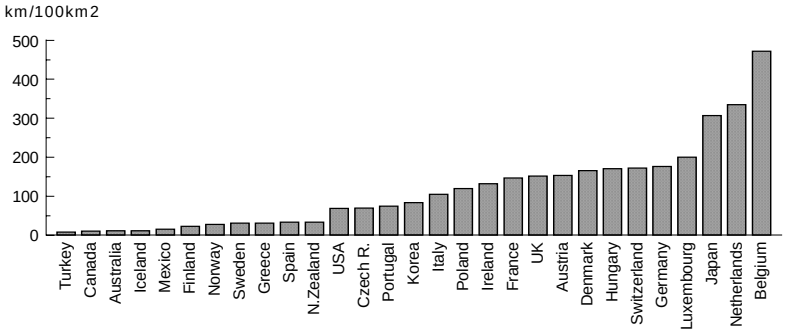
These indicators should be read in connection with other transport indicators including indicators on trends in capital and maintenance expenditure in transport infrastructure.

They should further be complemented with data on infrastructure for combined transport, on land use patterns and, at sub-national level, on the accessibility of leisure, education and other services.

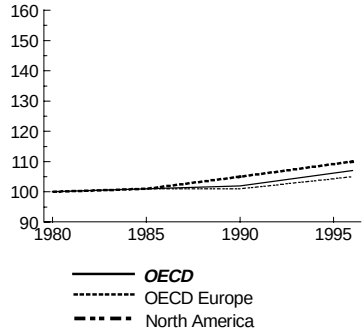
INFRASTRUCTURES

Road and rail network length and density

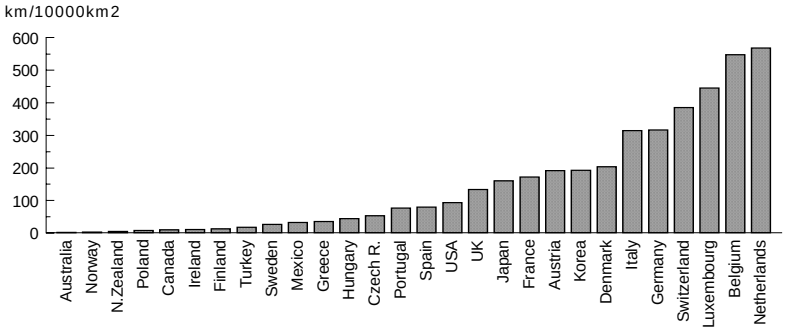
Road Network Density
1996



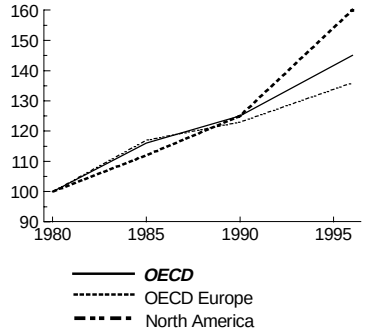
Trends in road network density
Index 1980 = 100



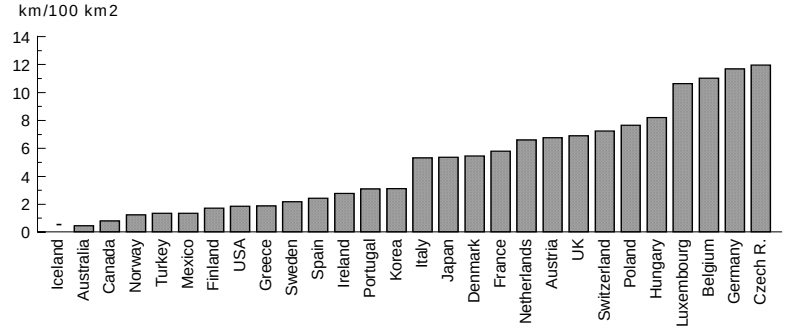
Motorways Density
1996



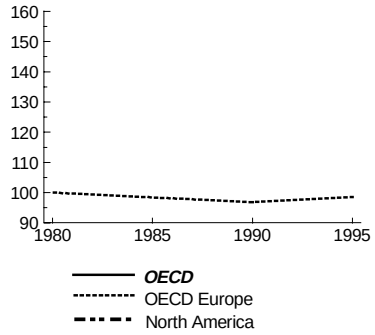
Trends in motorways density
Index 1980 = 100



Railway Density
1995



Trends in railway density
Index 1980 = 100



INFRASTRUCTURES

Road and rail network length and density

		Road network				Motorways				Railways (c)				
		Total Length (a)			Density	Length (a)			Density	Total length			Density	Electrified
		1000km	% Change		km/10²km²	km	% Change		km/10⁴km²	km	% Change		km/10²km²	%
		1996 (b)	'70-'80	'80-'96	1996	1996 (b)	'70-'80	'80-'96	1996	1995	70-'80	80-'95	1995	1995
Canada		1053	10	15	11	10099	71	114	10	80326	..	..	0.8	..
Mexico	*	312	200	46	16	6407	-4	587	33	26613	..	..	1.4	..
USA	*	6420	4	3	69	88400	33	24	94	174234	..	..	1.9	..
Japan		1160	10	4	307	6070	304	135	161	20314	..	..	5.4	..
Korea		83	6	78	84	1920	19	57	193	3101	..	..	3.1	..
Australia		913	-8	13	12	1360	6	25	2	36026	..	..	0.5	..
N. Zealand		92	2	-1	34	144	19	21	5	..	..	..	..	..
Austria	*	129	13	21	154	1607	96	71	192	5672	-1.1	-2.9	6.8	60
Belgium		144	34	14	472	1674	138	40	548	3368	-4.7	-15.2	11.0	70
Czech Rep.		55	0	-1	70	423	..	64	54	9430	..	..	12.0	29
Denmark		72	10	4	166	880	161	71	204	2349	1.9	-20.2	5.5	18
Finland	*	78	4	4	23	431	80	122	13	5859	4.4	-3.9	1.7	35
France	*	813	1	1	147	9500	239	80	172	31940	-5.9	-7.0	5.8	43
Germany	*	633	..	..	177	11300	..	..	317	41718	-3.6	..	11.7	44
w. Germany		-	11	..	..	-	78	..	..	..	..	..	..	..
Greece	*	41	6	11	31	470	40	416	36	2474	-4.7	-0.2	1.9	..
Hungary		159	-11	81	171	420	22	101	45	7632	-17.8	-2.5	8.2	31
Iceland		12	10	-1	12	-	..	..	..	-	-	-	-	-
Ireland		93	7	0	132	80	..	..	11	1954	-9.1	-1.8	2.8	2
Italy		317	5	7	105	9500	51	61	315	16003	0.4	-0.8	5.3	64
Luxembourg		5	3	1	200	115	529	161	445	275	-0.4	1.9	10.6	95
Netherlands		139	11	28	335	2360	82	33	568	2739	-12.3	-0.8	6.6	73
Norway		91	13	12	28	86	39	51	3	4023	0.0	-5.2	1.2	60
Poland		375	1	26	120	258	0	86	8	23968	4.5	-1.6	7.7	49
Portugal		69	24	33	75	710	92	459	77	2850	-0.1	-20.6	3.1	18
Spain	*	170	8	13	34	4037	177	119	80	12280	-7.0	-20.0	2.4	56
Sweden	*	138	3	7	31	1233	111	45	27	9782	-1.6	-18.5	2.2	75
Switzerland		71	11	7	172	1594	80	36	386	2987	0.6	1.5	7.2	99
Turkey	*	62	1	3	8	1405	..	5754	18	10466	27.0	3.2	1.3	10
UK	*	372	5	10	152	3270	145	26	134	16875	-5.3	-6.2	6.9	29
North America		7786	7	6	37	104906	34	37	49	..	..	..	..	..
OECD - Europe	*	4037	6	10	81	51352	96	60	103	172926	-2.0	-1.3	3.9	55
EU-15	*	3212	7	7	99	47166	97	56	145	114420	-3.9	-9.0	4.0	63
OECD		14072	5	8	41	165753	49	45	48	..	..	..	..	..

** See Annex 1 for data sources, notes and comments.*

VEHICLES

POLICY RELEVANCE

The number of motor vehicles is a primary indicator of potential pressure on the environment by the transport sector. An increasing number of vehicles means increasing potential sources of air pollution, noise, fuel consumption, etc. Vehicles also entail waste management issues. Environmental impacts from road motor vehicles depend on a number of factors, including type and size of engine, type and quality of fuel used, average fuel efficiency, age of vehicle, etc.

In general, vehicle stocks are related to socio-economic developments and to related consumption patterns. The number of private cars is closely related to socio-demographic developments such as the average size of households and urban land use patterns. It is also influenced by the level of income, by the accessibility of leisure, education and other services and by the level of development of public transport services. Over the last three decades, the socio-demographic developments of OECD countries have encouraged the use of private cars for local and regional trips. The number of goods vehicles is closely related to economic activity, related production patterns and trade flows.

THE INDICATORS

The indicators presented here relate to road motor vehicles, and in particular:

- Trends in vehicle stocks and intensities expressed as number of vehicles per unit of GDP, per capita and per road network length.
- Structure of vehicle stocks by type of vehicle (passenger cars, goods vehicles) and by type of fuel (diesel, petrol). Data on the share of "clean" vehicles (e.g. equipped with catalytic converters) will be available in the near future[18].

These indicators should be read in connection with other transport indicators (traffic, infrastructure, energy use and prices), and with indicators on vehicle taxes, on transport related air emissions, on population exposure to transport noise[19] and on waste from scrapped vehicles (generation and recycling, reuse).

They should further be complemented with data on the age structure of the vehicle fleet, and the share of "clean" vehicles (i.e. meeting environmental standards or requirements). Other useful information to better understand consumer decisions are trends in new registrations, the accessibility of leisure, education and other services and the level of development of public transport services.

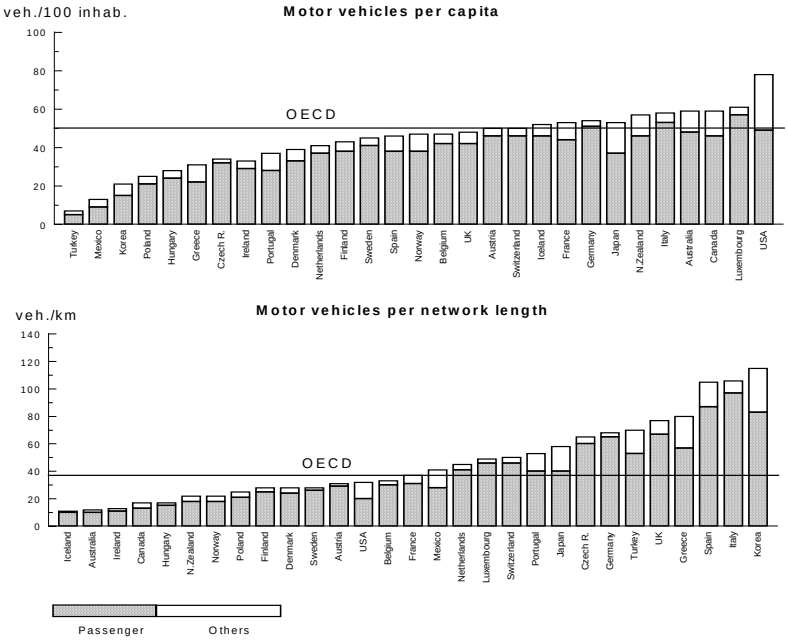
[18] Based on the results of the Common Questionnaire on Transport Statistics developed jointly by ECMT, UN/ECE and Eurostat.

19 . Transport noise, particularly road transport noise, is the major source of external acoustic energy in urban areas and is the principal cause of the perception of noise as a nuisance. Numerous research projects undertaken in OECD countries on the effects of noise and on its wider repercussions have found that an outdoor level of 65 dB(A) (Leq for day time period) is "unacceptable" and an outdoor level of less than 55 dB(A) is desirable. In OECD countries, more than 60 per cent of population is exposed to "unacceptable" noise levels from transportation. Standards for vehicle and plane noise have been applied in the majority of OECD countries since the 1980s.

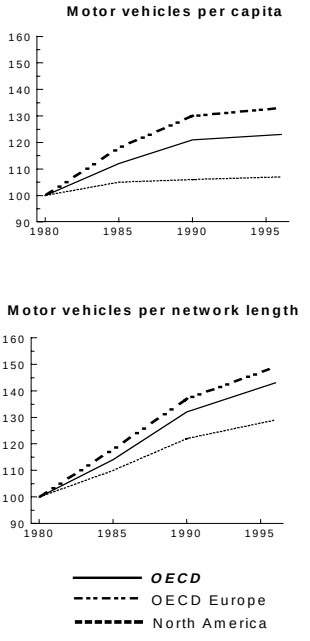
VEHICLES

Road vehicle stocks and intensities

Road vehicle intensities
State, 1996



Road vehicle intensities
Trends, Index 1980 = 100

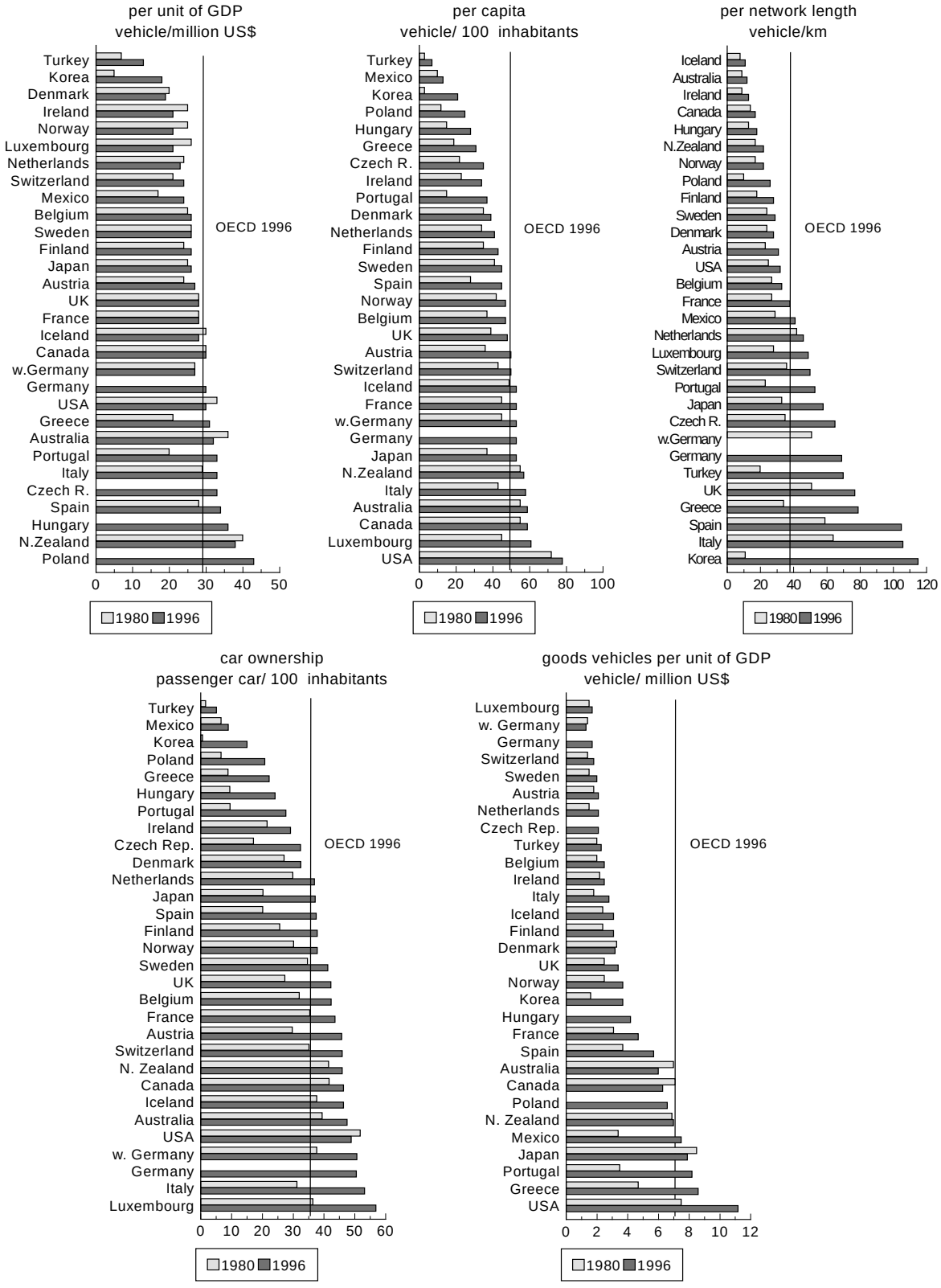


		Motor vehicles						Passenger cars			Goods vehicles		
		Total stocks (a)			Intensity per network length			Ownership			Intensity per unit of GDP		
		million	% change		veh./km	% change		veh./100inh.	% change		veh./10^6$	% change	
		1996(b)	'70-'80	'80-'96	1996(b)	'70-'80	'80-'96	1996(b)	'70-'80	'80-'96	1996(b)	'70-'80	'80-'96
Canada		17.7	63	34	17	49	16	46	35	11	6.3	32	-11
Mexico		12.9	245	109	41	15	43	9	177	35	7.5	45	117
USA		206.4	44	32	32	38	29	49	23	-6	11.2	32	49
Japan	*	67.2	115	81	58	96	74	37	139	84	7.9	3	-8
Korea		9.6	308	1710	115	286	919	15	247	2216	3.7	115	131
Australia	*	10.8	52	48	12	66	31	48	32	21	6.0	11	-14
N. Zealand		2.1	50	32	22	47	33	46	35	11	6.8	28	1
Austria	*	4.0	85	64	31	64	35	46	86	54	2.1	10	15
Belgium	*	4.8	49	38	33	12	21	42	50	32	2.5	-18	25
Czech Rep.		3.6	146	87	65	146	88	32	146	88	2.1	..	..
Denmark	*	2.0	24	24	28	13	19	33	24	20	3.2	-18	-3
Finland		2.2	68	60	28	62	54	38	66	48	3.1	2	26
France	*	30.8	51	42	38	49	40	44	45	23	4.7	-3	52
Germany	*	43.6	..	..	69	..	..	51	..	..	1.7	..	..
w. Germany	*	35.2	63	44	..	47	..	51	64	35	1.3	-4	-7
Greece		3.3	267	159	79	247	133	22	245	151	8.6	129	84
Hungary		2.8	132	137	18	161	31	24	205	156	3.9	..	..
Iceland		0.1	104	48	11	85	49	46	89	23	3.2	-18	26
Ireland		1.2	80	52	13	69	52	29	62	35	2.5	-18	12
Italy		33.5	72	75	106	65	64	53	66	70	2.8	8	56
Luxembourg	*	0.3	44	78	49	40	76	57	36	56	1.4	-9	9
Netherlands	*	6.3	70	40	46	53	9	37	62	23	2.1	-17	46
Norway		2.1	67	47	22	48	31	38	69	26	3.7	-28	47
Poland	*	9.6	290	213	26	285	149	21	355	211	6.5	..	..
Portugal	*	3.7	117	205	53	75	130	28	87	189	8.2	49	135
Spain		17.9	173	100	105	152	77	38	171	86	5.7	31	55
Sweden		4.0	26	29	29	22	21	41	22	19	2.0	3	36
Switzerland	*	3.5	62	46	50	47	37	46	60	31	1.7	31	27
Turkey		4.3	293	270	70	290	259	5	332	213	2.3	81	12
UK	*	28.5	28	64	77	21	50	42	29	54	3.4	-10	34
North America		237	48	35	30	39	28	39	21	-6	10.5	31	48
OECD Europe	*	212	66	68	53	57	52	37	59	52	3.3	..	*40*
EU-15	*	186	61	62	58	51	51	44	57	51	3.3	..	*42*
OECD	*	539	60	55	38	52	44	37	43	28	7.1	..	*34*

** See Annex 1 for data sources, notes and comments.*

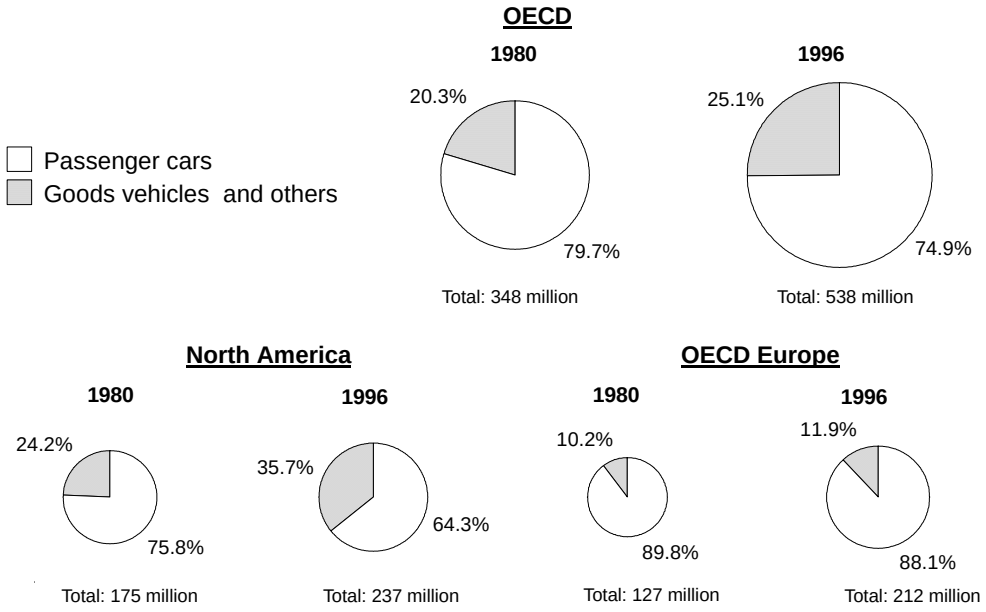
VEHICLES

Road vehicle intensities



VEHICLES

Structure of the road vehicle fleet



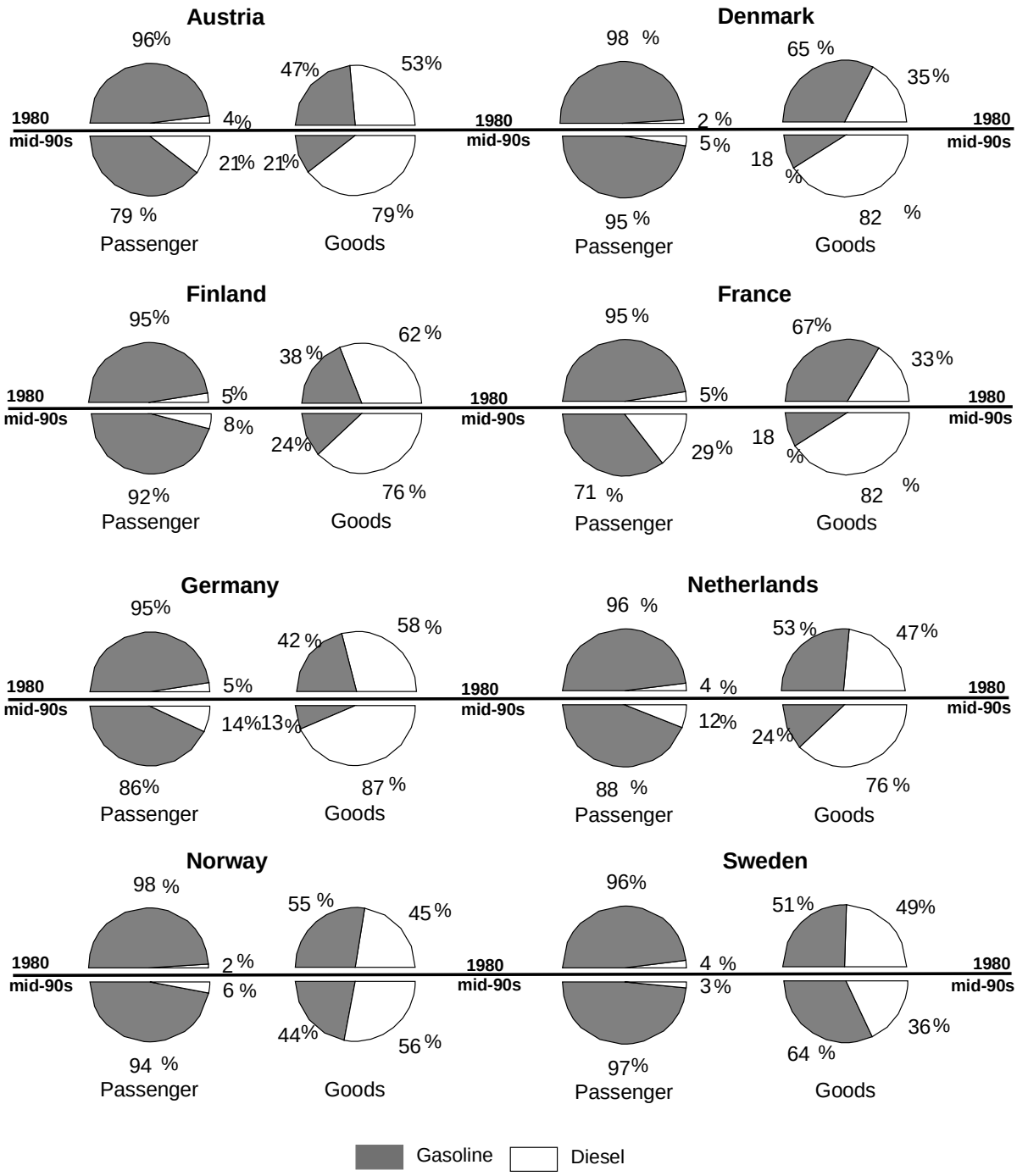
	By type of vehicle (a)				By type of motor fuel used (a)							
	Passenger cars		Goods vehicles		Passenger cars				Goods vehicles			
	% of total		% of total		Gasoline (%)	Diesel (%)	Gasoline % change	Diesel % change	Gasoline (%)	Diesel (%)	Gasoline % change	Diesel % change
	1980	1996 (b)	1980	1996 (b)	mid-1990s		since 1980		mid-1990s		since 1980	
Canada	78	79	22	21	..	..	..	..	..	..	..	..
Mexico	75	67	23	32	..	..	..	..	..	..	..	..
USA	76	63	22	37	..	..	..	..	..	..	..	..
Japan	64	70	36	30	..	..	..	..	..	..	..	..
Korea	47	72	45	21	90	10	..	..	1	99	..	..
Australia	80	81	20	19	..	..	..	..	..	..	..	..
N. Zealand	83	81	16	18	..	..	..	..	..	..	..	..
Austria	92	92	8	8	79	21	27	809	21	79	-19	162
Belgium	91	90	8	10	69	31	1	470	21	79	..	..
Czech Rep.	92	93	7	7	93	7	58	..	..	..	..	33
Denmark	84	84	15	17	95	5	21	318	18	82	-69	165
Finland	89	88	11	12	92	8	49	127	24	76	6	105
France	88	83	12	17	71	29	-1	739	18	82	-62	256
Germany *	..	95	..	6	86	14	60	395	13	87	-33	217
w. Germany *	95	95	5	..	..	..	..	..	..	..	..	..
Greece	68	71	31	28	99	1	139	2600	..	..	..	..
Hungary	86	87	11	12	93	7	111	4	44	56	..	..
Iceland	90	88	9	11	..	..	..	..	..	..	..	..
Ireland	92	87	8	12	87	13	..	..	..	..	..	..
Italy *	93	91	7	8	..	..	..	..	..	..	..	..
Luxembourg	93	93	6	8	82	18	16	348	..	..	..	..
Netherlands	93	90	6	9	88	12	18	273	24	76	-0.1	258
Norway	88	81	11	17	94	6	29	323	44	56	78	181
Poland	78	84	20	15	90	10	..	..	..	..	..	..
Portugal	78	75	22	25	..	..	..	..	..	..	..	..
Spain	85	83	15	17	..	..	..	..	..	..	..	..
Sweden	94	92	6	8	97	3	28	-7	64	36	116	25
Switzerland	93	92	7	7	97	3	37	911	..	..	..	..
Turkey	63	76	28	18	..	..	..	..	..	..	..	..
UK	89	87	10	12	90	10	..	..	34	66	..	..
North America	76	64	22	35	..	..	..	..	..	..	..	..
OECD Europe	90	88	10	12	..	..	..	..	..	..	..	..
EU-15	90	88	9	11	..	..	..	..	..	..	..	..
OECD	80	75	19	25	..	..	..	..	..	..	..	..

** See Annex 1 for data sources, notes and comments.*

VEHICLES

Structure of road vehicle fleet

Selected countries



ENERGY USE

POLICY RELEVANCE

The consumption of energy by transport activities is an important determinant of the transport sector's contribution to air pollution. World-wide, the transport sector consumes more than 60 per cent of oil products, which constitute about 98 per cent of transport energy use. The structure of energy consumption by transport is directly related to the composition of pollutant emissions. Changes in the fuel quality accompanying the introduction of road vehicles equipped with three-way catalytic converters further influence the level and composition of exhaust emissions.

In the case of road transport, diesel fuel and gasoline for example generate different types of air pollutants: diesel-powered vehicles emit less carbon monoxide (CO) and nitrogen oxides (NOx) than gasoline-powered vehicles but more aromatic volatile organic compounds (VOC) and particles which may have carcinogenic effects. In addition, diesel combustion generates emissions of sulphur dioxide (SO_2) but no emissions of lead.

THE INDICATORS

The indicators presented here relate to:

- Final energy consumption (FC) by transport expressed in Mtoe and the relative contribution of transport to total final energy consumption (TFC), as well as related intensities per unit of GDP and per capita.
- Structure of transport energy consumption by mode (road, rail, air) expressed in percent.
- Structure of road fuel consumption by type of fuel (gasoline, diesel).
- Road fuel consumption intensities per traffic volume and per vehicle.

These indicators should be read in combination with indicators on the structure of fuel prices, energy prices and taxes, the structure of the road vehicle fleet and transport related air pollution.

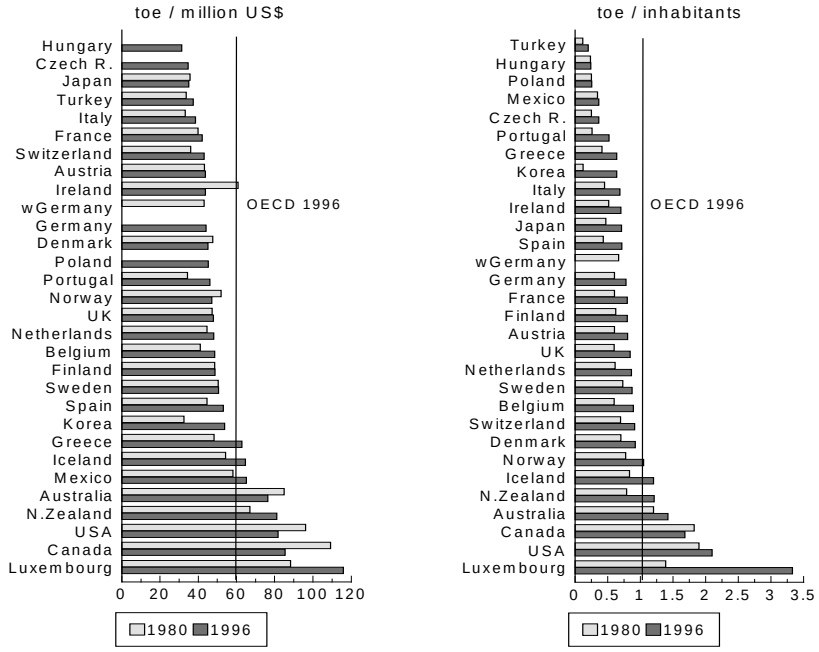
They should further be complemented with data on fuel quality. A further breakdown of road fuel consumption i.e. leaded vs. unleaded gasoline would also be desirable.

Depending on the use of these indicators at national level, it might also be useful to complement them with more detailed information about the energy efficiency of cars.[20]

[20] *IEA publication reference*

ENERGY USE

Final energy consumption by the transport sector - intensities and structure by mode

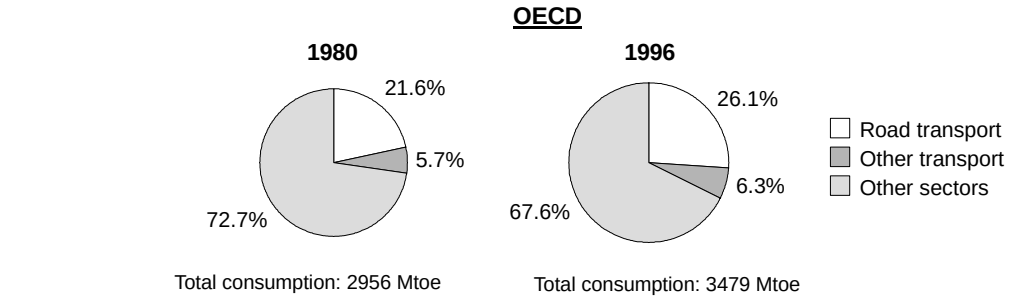


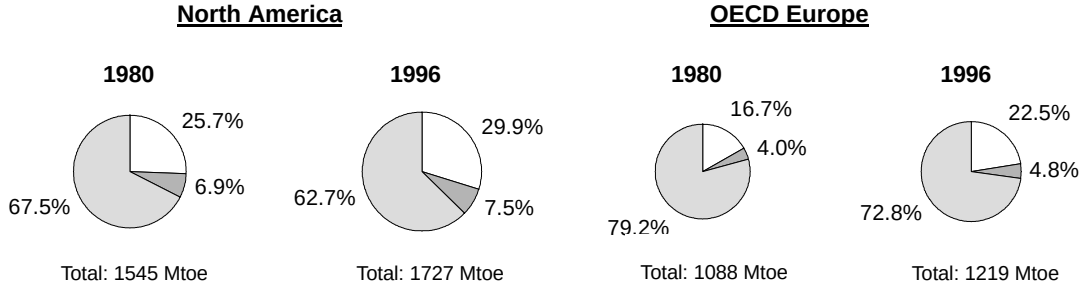
	Final consumption					Consumption intensity						Consumption structure by transport mode % of total								
						per unit of GDP			per capita											
	Mtoe	% change		% of TFC		toe /10⁶$	% change		toe/cap	% change		Rail			Road			Air		
	1996	'70-'80	'80-'96	1980	1996	1996	'70-'80	'80-'96	1996	'70-'80	'80-'96	1970	'80	'96	1970	'80	'96	1970	'80	'96
Canada	51	54	13	29	28	86	1	-22	1.7	33	-8	7	5	4	76	78	73	8	9	10
Mexico	36	..	46	35	35	65	..	12	0.4	..	6	..	0	2	..	61	91	..	6	7
USA	559	19	29	33	39	82	-12	-15	2.1	7	11	4	3	2	77	80	80	14	13	14
Japan	90	62	62	24	27	35	5	-2	0.7	44	51	11	5	3	72	79	82	7	7	11
Korea	29	..	502	14	24	54	..	65	0.6	..	404	..	1	2	..	21	76	..	6	9
Australia	26	54	47	37	39	77	11	-10	1.4	34	18	5	4	3	78	79	79	10	10	15
N. Zealand	4	33	77	35	42	81	14	21	1.2	20	53	0	0	0	71	66	51	12	13	19
Austria	7	45	42	24	29	44	2	1	0.8	44	33	13	7	4	83	90	86	3	3	8
Belgium	9	36	53	18	23	49	-2	18	0.9	33	49	5	4	2	79	85	81	9	9	12
Czech Rep.	4	..	42	7	14	35	..	..	0.4	..	43	..	4	7	..	78	86	..	10	3
Denmark	5	16	34	24	30	45	-7	-5	0.9	12	31	3	3	2	65	65	75	20	21	18
Finland	4	41	37	15	18	49	0	0	0.8	36	28	7	4	2	85	85	84	5	8	11
France	47	55	43	24	29	42	12	6	0.8	46	32	7	4	2	83	86	85	8	8	11
Germany	64	39	34	19	26	44	..	..	0.8	38	28	13	6	3	77	84	86	7	8	10
w. Germany	..	43	..	21	..	..	9	..	..	41	..	9	4	..	81	86	..	7	7	..
Greece	7	107	67	35	39	63	31	30	0.6	89	53	7	1	1	58	58	73	34	29	19
Hungary	2	..	-5	12	14	32	..	..	0.2	..	1	..	21	8	..	71	84	..	5	8
Iceland	0.3	20	70	14	17	65	-35	19	1.2	8	44	0	0	0	52	65	64	40	28	30
Ireland	3	52	44	27	30	44	-4	-28	0.7	32	35	4	2	3	71	84	81	26	13	15
Italy	40	50	54	25	32	39	6	16	0.7	43	51	4	2	2	82	86	89	10	8	8
Luxembourg	1	158	173	18	44	116	100	31	3.3	140	139	10	2	1	76	84	84	14	13	15
Netherlands	13	40	53	17	23	48	5	8	0.9	29	40	2	2	1	69	79	72	12	11	21
Norway	5	25	45	19	23	47	-22	-9	1.1	18	35	3	3	2	55	60	68	10	13	14
Poland	10	82	11	11	14	45	..	..	0.3	66	2	21	17	7	73	78	88	4	3	5
Portugal	5	82	100	31	35	46	15	33	0.5	61	98	8	3	1	57	74	85	31	21	12
Spain	28	94	75	33	40	53	37	19	0.7	75	66	9	2	2	62	66	78	12	13	12
Sweden	8	20	27	17	22	51	-1	0	0.9	16	19	6	4	4	79	85	84	11	9	11
Switzerland	7	24	46	26	32	43	2	19	0.9	21	31	5	4	3	77	77	75	16	18	22
Turkey	13	70	132	21	26	38	14	11	0.2	36	64	25	7	2	65	88	86	1	3	10
UK	50	26	47	25	31	48	4	1	0.8	25	41	6	3	2	76	78	78	14	15	17
North America	645	28	28	33	37	81	-9	-14	1.6	10	5	4	3	2	77	79	80	13	12	14
OECD Europe	332	49	47	21	27	45	..	..	0.7	40	36	8	5	3	76	81	83	10	10	12
EU-15	320	45	47	21	28	50	..	..	0.9	39	40	8	4	3	76	81	82	10	10	12
OECD	1126	37	39	27	32	60	..	..	1.0	23	23	5	4	2	76	79	81	12	11	13

** See Annex 1 for data sources, notes and comments.*

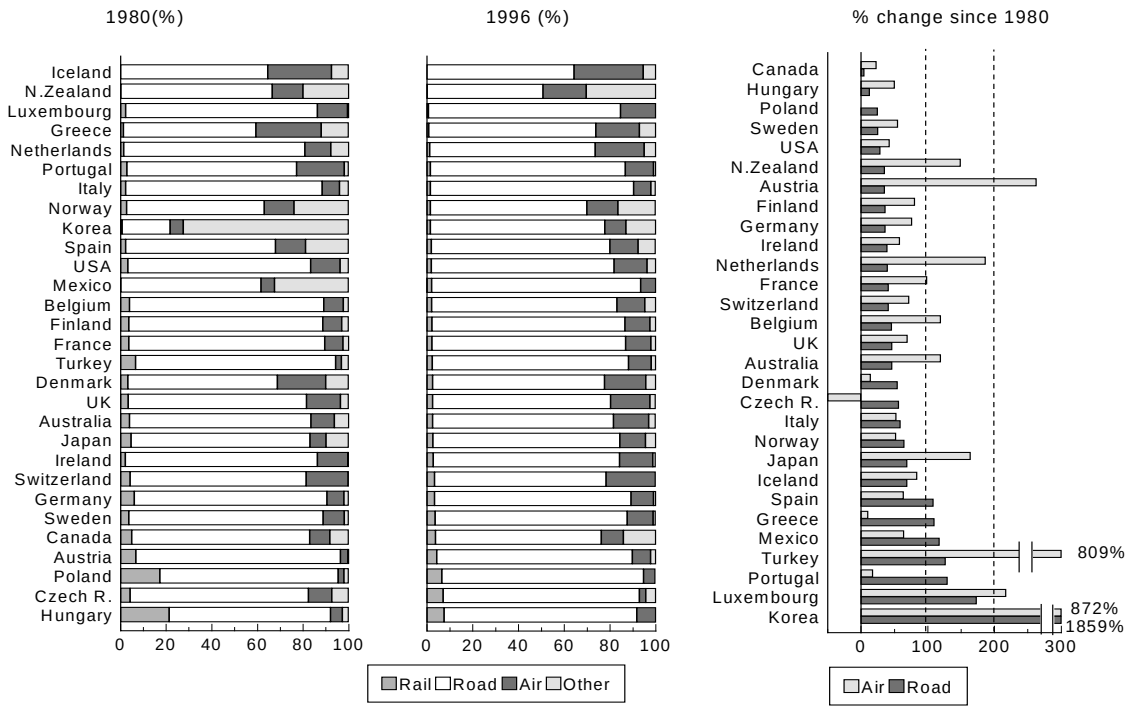
ENERGY USE

Contribution of the transport sector to total final energy consumption





Structure of transport energy consumption by mode



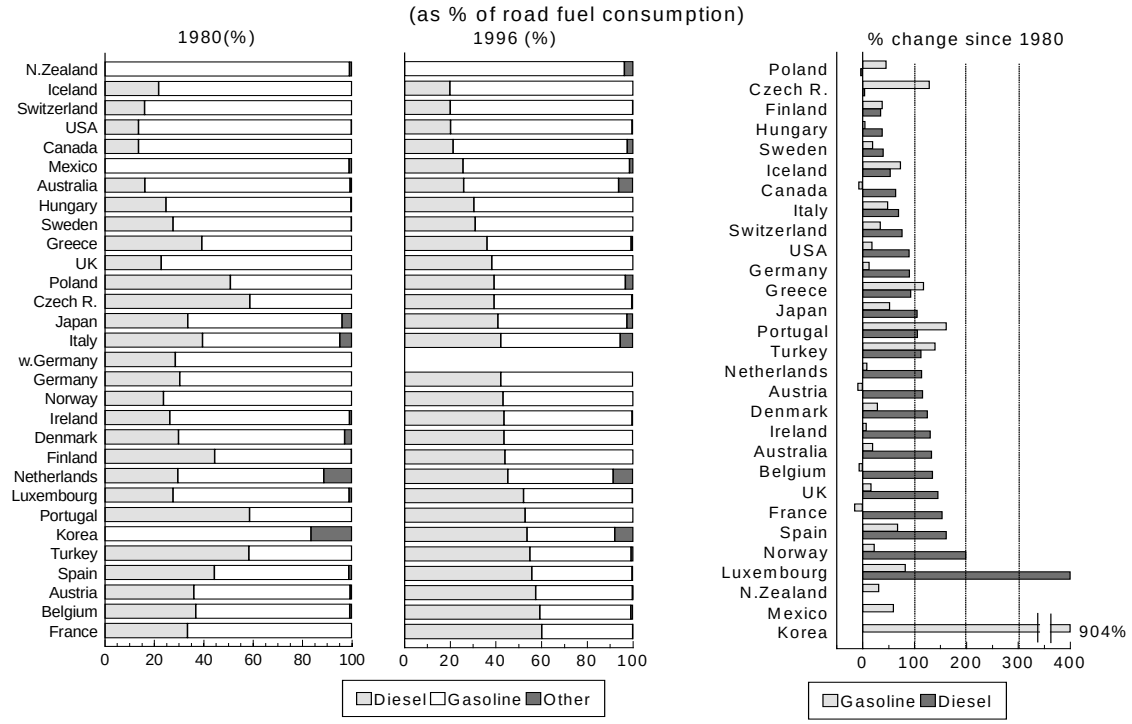
ENERGY USE

Consumption of road fuels: intensities and structure by type of fuel

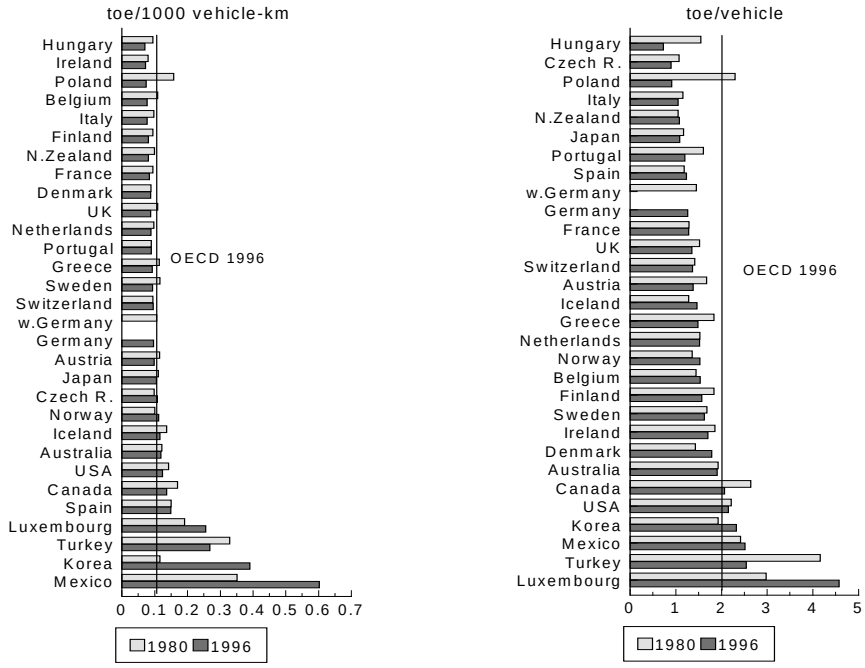
	Diesel			Gasoline			Total			Per traffic volume			Per vehicle		
	Mtoe	% Change		Mtoe	% Change		Mtoe	% Change		toe/10^3 veh-km	% Change		toe/vehicle	% Change	
	1996	'70-'80	'80-'96	1996	'70-'80	'80-'96	1996	'70-'80	'80-'96	1996	'70-'80	'80-'96	1996	'70-'80	'80-'96
Canada	7.8	337	64	27.9	44	-8	36.7	59	5	0.14	-3	-19	2.07	-3	-22
Mexico	8.4	..	..	23.8	..	60	32.6	..	118	0.60	..	71	2.52	..	4
USA	90.0	108	90	354.8	17	19	446.3	24	29	0.12	-8	-13	2.16	-14	-3
Japan	30.1	94	106	41.5	73	53	73.5	75	69	0.11	2	-5	1.09	-18	-7
Korea	12.0	..	..	8.6	..	904	22.3	..	2081	0.39	..	233	2.33	..	20
Australia	5.3	138	133	14.0	47	20	20.6	58	47	0.12	8	-2	1.92	4	-1
N. Zealand	..	..	..	2.2	24	32	2.2	25	35	0.08	-1	-18	1.09	-17	3
Austria	3.2	59	116	2.4	54	-9	5.6	57	35	0.10	-3	-14	1.39	-15	-17
Belgium	4.4	78	135	2.9	34	-7	7.4	47	46	0.08	7	-29	1.54	-2	6
Czech Rep.	1.3	..	5	2.0	..	129	3.3	..	57	0.11	..	10	0.91	..	-16
Denmark	1.6	50	125	2.1	5	29	3.7	17	54	0.09	2	-2	1.79	-6	25
Finland	1.5	49	35	2.0	39	38	3.5	42	36	0.08	3	-15	1.58	-15	-15
France	23.9	116	154	15.8	42	-16	39.7	61	41	0.08	7	-11	1.29	6	0
Germany	23.3	43	90	31.9	55	13	55.2	51	37	0.10	..	..	1.27	..	..
w. Germany	..	53	..	..	52	..	..	52	..	..	5	..	..	-7	..
Greece	1.8	106	93	3.1	110	118	4.9	108	110	0.09	-6	-18	1.50	-43	-19
Hungary	0.6	..	38	1.4	..	5	2.1	..	13	0.07	..	-26	0.74	..	-52
Iceland	0.0	..	54	0.2	70	73	0.2	49	69	0.12	19	-15	1.47	-27	14
Ireland	0.9	138	131	1.2	65	7	2.1	81	39	0.07	5	-9	1.71	1	-8
Italy	15.0	123	70	18.5	30	49	35.4	59	59	0.08	3	-21	1.06	-8	-9
Luxembourg	0.6	153	414	0.6	202	83	1.2	183	173	0.26	94	33	4.58	97	53
Netherlands	4.4	105	114	4.5	27	9	9.7	61	40	0.09	11	-9	1.53	-5	0
Norway	1.4	3	199	1.8	51	23	3.2	36	65	0.11	-21	12	1.54	-19	12
Poland	3.5	127	-4	5.1	69	46	8.8	95	25	0.07	-42	-53	0.92	-50	-60
Portugal	2.4	261	107	2.1	58	162	4.5	136	129	0.09	4	0	1.21	9	-25
Spain	12.4	112	162	9.7	96	68	22.2	105	108	0.15	2	0	1.24	-25	4
Sweden	2.0	36	40	4.5	27	20	6.5	29	25	0.09	1	-19	1.64	3	-3
Switzerland	1.0	-4	76	3.9	31	34	4.9	24	41	0.10	-9	1	1.38	-24	-3
Turkey	6.1	150	113	4.9	103	140	11.0	128	126	0.27	-6	-18	2.55	-42	-39
UK	14.9	16	145	24.0	34	17	38.8	30	46	0.09	-4	-19	1.36	2	-11
North America	106.2	119	104	406.5	24	18	515.5	32	30	0.13	-4	-11	2.55	-11	13
OECD Europe	126.0	80	104	144.3	47	22	273.8	58	51	0.09	5	-14	1.69	-5	17
EU-15	112.2	72	114	125.1	43	18	240.3	53	50	0.09	3	-13	1.65	-5	18
OECD	279.5	96	114	617.0	32	23	908.0	41	42	0.12	..	..	2.13	..	..

ENERGY USE

Structure of road fuel consumption



Road fuel consumption intensities



AIR POLLUTION

POLICY RELEVANCE

Transport contributes to atmospheric pollution at local, regional and global level. Emissions from the transport sector represent a high proportion of overall man-made emissions in industrialised countries. Most of these emissions are directly related to the consumption of energy by transport activities: world-wide, the transport sector consumes more than 60 per cent of oil products, which constitute about 98 per cent of transport energy use. They are further influenced by a number of factors, including type and size of engine, type and quality of fuel used, average fuel efficiency, age of vehicle, etc.

Carbon monoxide (CO), carbon dioxide (CO_2), nitrogen oxides (NOx), particulate matter (PM) and volatile organic compounds (VOC) are the main pollutants emitted directly by motor fuel combustion (primary pollutants). Through reactions in the atmosphere these contribute to the formation of secondary pollutants (photochemical oxidants, primarily ozone, smog, atmospheric acids, etc.). Other pollutants include for example lead and SOx.

At local level, transport is a main contributor to air pollution in urban areas where road traffic and congestion concentrate. Concerns relate mainly to its effects on human health, but also to its effects on buildings and monuments. Motor vehicles are also a large source of toxic air pollutants including VOC species (e.g. benzene, 1,3-butadiene, formaldehyde, acetaldehyde and polynuclear aromatic hydrocarbons), lead, fine particulate matter, etc.

At regional level, transfrontier pollution from transport contributes to acidification, eutrophication and large-scale formation of tropospheric ozone and to related ecological impacts.

At global level, transport is responsible for an important share of CO_2 emissions from energy use, a main contributor in global warming. It further contributes to emissions of other pollutants with likely global impacts (e.g. CO, tropospheric O3, persistent organics, methane, nitrous oxide (N_2O), etc.). The contribution of commercial aviation to greenhouse gas emissions has accelerated in recent years, and the continuing growth in air traffic is expected to further increase pressures on emissions in the future. It appears also that maritime transport plays an increasingly important role in global SOx emissions due to the very high sulphur content of maritime fuel. Since most of these emissions take place outside the national territory, they are not recorded in national emission estimates and thus often neglected.

The level of the transport sector's contribution to climate change raises questions as to countries' commitments made under the UN Framework Convention on Climate Change and to the transport sector's role. Measures to control and reduce CO_2 emissions from transport also include the establishment of a dialogue with the industry (i.e. motor vehicle manufacturers, fuel industry).

CO_2, NOx, VOC and particulate emissions are four of six criteria to achieve "environmentally sustainable transport (EST)". The recommended quantitative criteria for CO_2, NOx and VOC are 20 per cent, 10 per cent and 10 per cent, respectively, below total emission levels in 1990. For particulates, the recommended reduction is 55-99 per cent depending on local and regional conditions.

THE INDICATORS

The indicators presented here relate to:

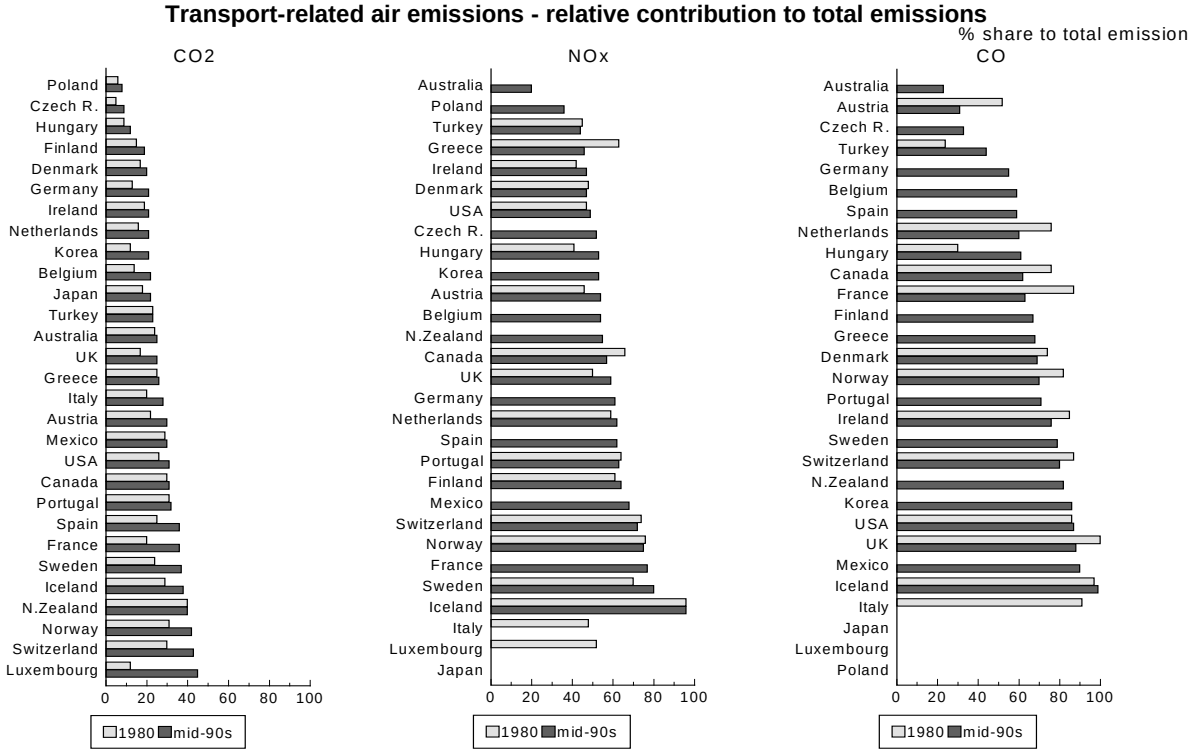
- Total CO_2, CO, NOx, VOC, particulates and SOx emissions from transport (i.e. mobile sources), their relative contribution to total man-made emissions, as well as emission intensities per capita and per unit of GDP. The data refer to national emission estimates; data on emissions taking place outside the national territory (e.g. from international air or maritime transport) are not included and may need further development if needed.
- Emissions of CO_2, CO, NOx, VOC, particulates and SOx from road transport and related intensities per unit of traffic volume (i.e. per vehicle-km).

These indicators should be read in connection with indicators on transport trends (traffic, vehicle stocks, energy use) and on urban air quality. If data availability permits, they should further be broken down by type of transport, i.e. passenger, freight, and by mode.

They should further be complemented with data on population exposure to air pollution in heavy traffic areas and on traffic congestion. Data on international air emissions might also be desirable.

AIR POLLUTION

Transport-related air emissions - relative contribution to total emissions

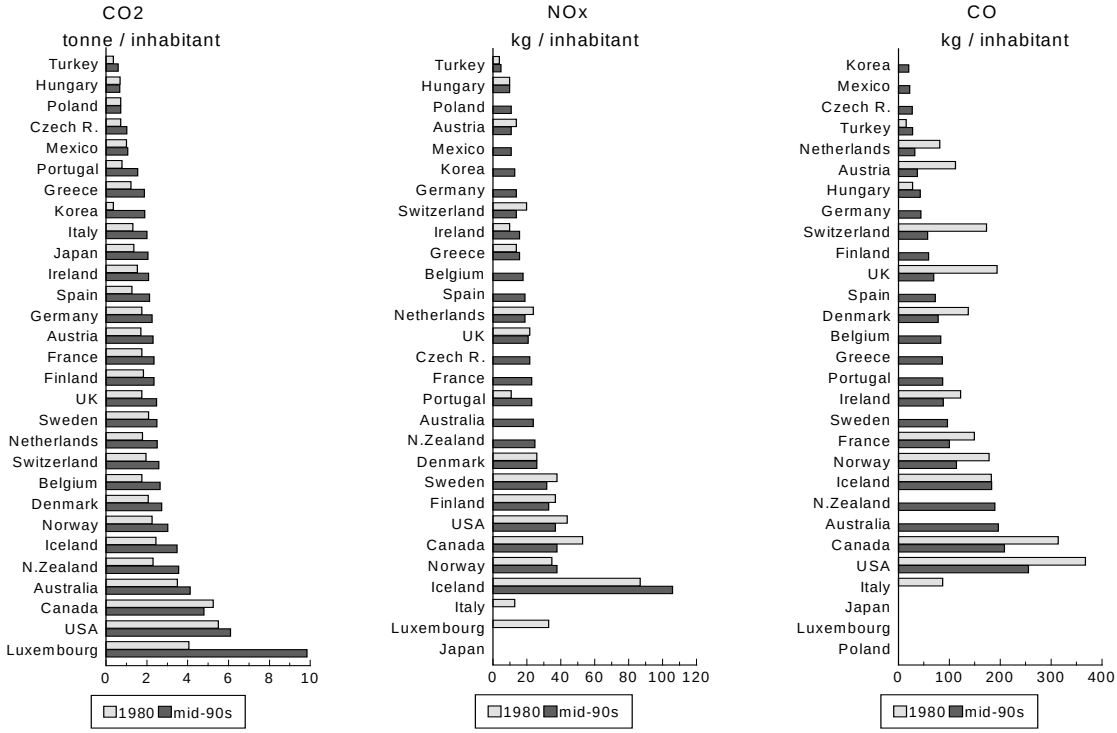


		Share of transport emissions (% of total emissions)											
		early 1980s						mid 1990s					
		CO2	NOx	VOC	Part.	CO	SOx	CO2	NOx	VOC	Part.	CO	SOx
Canada	*	30	66	49	5	76	3	31	57	23	8	62	5
Mexico	*	29	..	..	..	..	..	30	68	52	11	90	6
USA	*	26	47	44	11	86	3	31	49	37	22	87	3
Japan		18	..	..	..	..	..	22	..	..	..	..	..
Korea	*	12	..	..	..	..	..	21	53	..	24	86	20
Australia	*	24	..	..	..	..	..	25	20	29	..	23	..
N. Zealand	*	40	..	..	..	..	..	40	55	65	17	82	19
Austria	*	22	46	27	..	52	2	30	54	14	..	31	6
Belgium	*	14	..	..	..	..	..	22	54	49	..	59	7
Czech Rep.	*	5	..	..	..	..	1	9	52	27	6	33	1
Denmark	*	17	48	71	..	74	5	20	47	53	..	69	5
Finland		15	61	..	..	..	2	19	64	29	23	67	3
France	*	20	..	..	..	87	4	36	77	46	..	63	15
Germany	*	13	..	..	..	..	..	21	61	32	11	55	2
w. Germany	*	15	49	40	7	71	3	..	66	31	14	64	9
Greece	*	25	63	48	..	..	20	26	46	57	..	68	6
Hungary	*	9	41	..	3	30	3	12	54	48	12	61	2
Iceland	*	29	96	75	..	97	43	38	96	76	..	99	32
Ireland	*	19	42	44	9	85	2	21	47	34	..	76	5
Italy	*	20	48	..	39	91	5	28	..	..	..	..	..
Luxembourg	*	12	52	45	..	..	6	45	..	..	..	..	..
Netherlands	*	16	59	46	..	76	6	21	62	42	41	60	21
Norway	*	31	76	46	23	82	12	42	75	21	25	70	13
Poland		6	..	37	..	..	..	8	36	37	3	..	2
Portugal	*	31	64	56	13	..	4	32	63	31	..	71	6
Spain	*	25	..	..	..	..	..	36	62	45	..	59	6
Sweden	*	24	70	..	..	..	9	37	80	38	..	79	24
Switzerland		30	74	45	15	87	8	43	72	30	26	80	7
Turkey		23	45	..	..	24	..	23	44	..	..	44	..
UK	*	17	50	38	17	155	2	25	59	36	26	88	4
North America		27	..	..	..	..	..	31	51	..	..	..	4
OECD Europe	*	16	..	..	..	..	..	24	60	..	..	..	5
EU-15	*	17	..	..	..	..	..	26	63	..	..	..	7
OECD	*	21	..	..	..	..	..	27	52	..	..	..	5

** See Annex 1 for data sources, notes and comments.*

AIR POLLUTION

Transport-related air emissions - emission intensities per capita

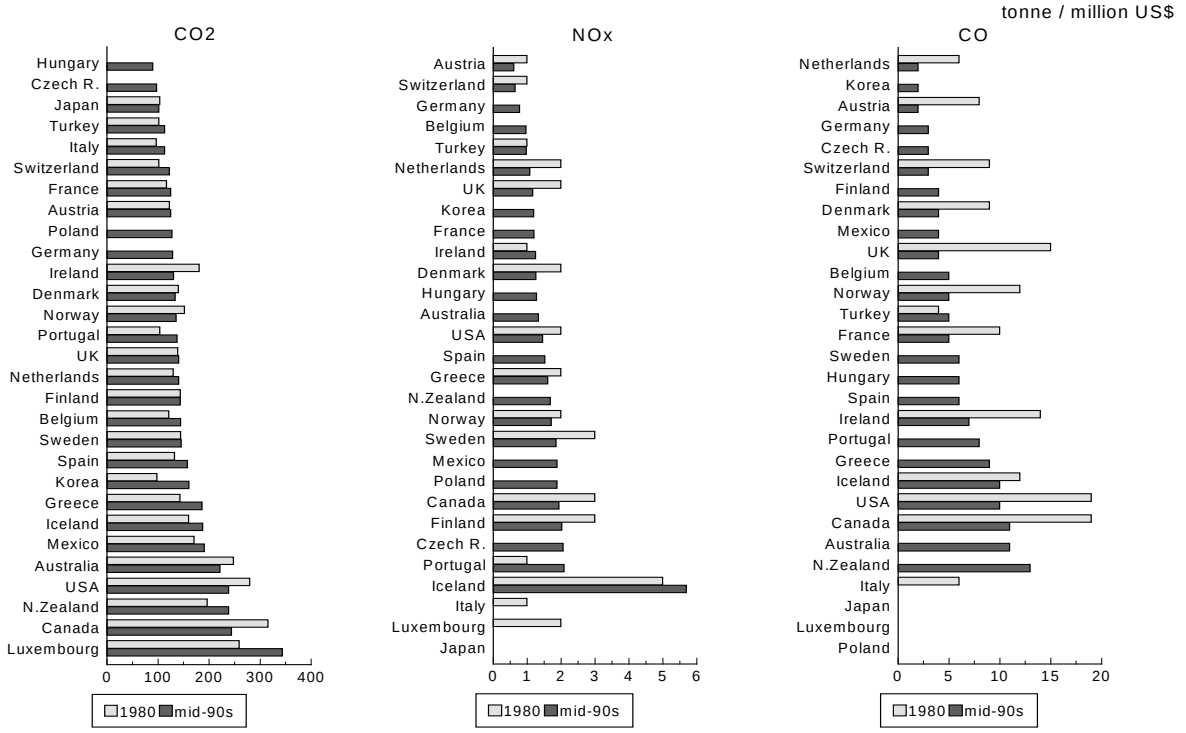


		Transport emissions per capita , mid-1990s t./cap. kg/cap.						Transport emissions per capita, change since 1980 %					
		CO2	NOx	VOC	Part.	CO	SOx	CO2	NOx	VOC	Part.	CO	SOx
Canada	*	4.8	38.2	20.8	4.9	209.2	4.1	-9	-28	-50	22	-34	-26
Mexico	*	1.1	11.2	2.8	0.5	22.8	1.4	5	..	..	..	..	..
USA	*	6.1	36.5	28.8	2.4	255.9	2.1	11	-17	-33	-17	-30	-26
Japan		2.1	..	..	..	..	..	51	..	..	..	..	..
Korea	*	1.9	13.4	..	2.2	21.2	7.0	399	..	..	..	..	..
Australia	*	4.1	23.6	29.3	..	197.4	..	18	..	..	..	..	..
N. Zealand	*	3.6	25.3	31.3	1.9	190.1	2.4	54	..	..	..	..	..
Austria	*	2.3	11.2	6.7	..	38.2	0.4	35	-20	-61	..	-66	-68
Belgium	*	2.7	17.9	14.5	..	83.7	1.7	51	..	..	..	..	..
Czech Rep.	*	1.0	22.0	7.5	1.0	28.3	0.8	43	..	..	..	..	-72
Denmark	*	2.7	25.7	13.8	1.5	78.9	1.6	32	1	-22	139	-43	-61
Finland		2.4	33.5	10.3	2.3	60.0	0.6	28	-11	..	-17	..	-76
France	*	2.4	22.5	20.4	..	101.5	2.5	33	..	..	..	-33	8
Germany	*	2.3	13.8	7.2	0.7	45.2	0.5	29	..	..	..	..	..
Greece	*	1.9	16.4	22.4	..	86.5	3.2	53	15	249	..	..	-62
Hungary	*	0.7	10.6	7.2	1.7	44.0	1.0	-1	2	..	-5	52	-78
Iceland	*	3.5	105.7	33.8	..	184.1	10.0	42	21	2	..	0	-31
Ireland	*	2.1	16.0	19.3	..	88.8	2.0	36	57	88	..	-28	29
Italy	*	2.0	..	..	..	..	..	52	..	..	..	..	..
Luxembourg	*	9.9	..	..	..	..	..	141	..	..	..	..	..
Netherlands	*	2.5	19.4	9.3	1.3	33.3	1.8	40	-21	-48	-35	-59	-20
Norway	*	3.0	38.3	17.9	1.5	115.4	1.0	34	8	-10	31	-35	-75
Poland		0.7	10.8	7.4	0.9	..	1.2	0	..	-32	..	..	..
Portugal	*	1.6	23.2	9.6	..	88.3	2.0	97	114	83	..	..	85
Spain	*	2.1	19.3	13.8	..	73.0	3.1	67	..	..	..	..	..
Sweden	*	2.5	32.1	19.2	..	97.0	2.7	20	-15	..	..	..	-49
Switzerland		2.6	13.9	8.9	0.7	57.9	0.4	32	-29	-61	-18	-67	-74
Turkey		0.6	5.4	5.4	..	28.5	..	63	52	77	..	77	..
UK	*	2.5	20.6	12.8	1.0	69.7	1.4	41	-6	-20	-10	-64	-23
North America		6.3	40.3	..	..	..	2.7	10	..	..	..	..	..
OECD Europe	*	1.9	17.1	..	..	..	1.8	36	..	..	..	..	..
EU-15	*	2.3	19.7	..	..	..	2.1	41	..	..	..	..	..
OECD	*	3.0	20.5	..	..	..	2.1	23	..	..	..	..	..

** See Annex 1 for data sources, notes and comments.*

AIR POLLUTION

Transport-related air emissions - emission intensities per unit of GDP

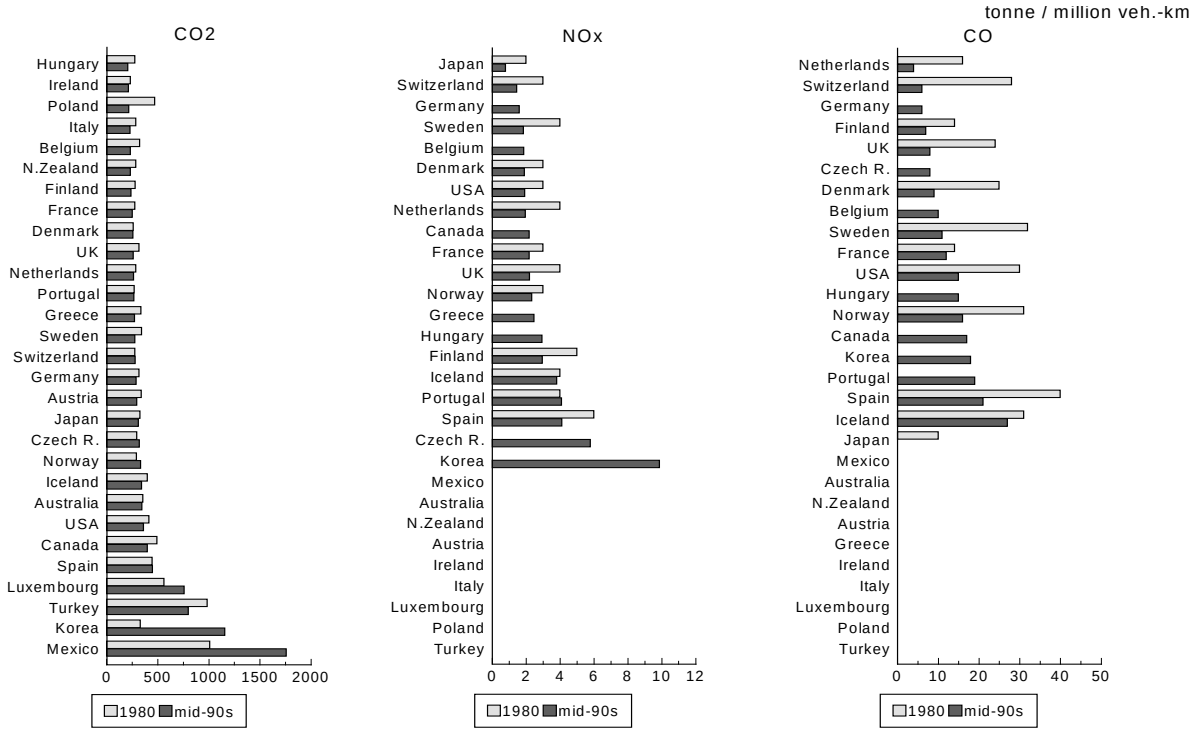


		Transport emissions per unit of GDP, mid-1990s tonne / million US$						Transport emissions per unit of GDP, change since 1980 %					
		CO2	NOx	VOC	Part.	CO	SOx	CO2	NOx	VOC	Part.	CO	SOx
Canada	*	244	1.9	1.1	0.25	10.6	0.21	-23	-39	-58	4	-44	-37
Mexico	*	191	1.9	0.5	0.08	3.9	0.24	12	..	..	..	..	..
USA	*	239	1.5	1.2	0.10	10.2	0.08	-15	-34	-47	-34	-45	-42
Japan		102	..	..	..	..	..	-2	..	..	..	..	..
Korea	*	161	1.2	..	0.19	1.9	0.62	63	..	..	..	..	..
Australia	*	222	1.3	1.7	..	11.2	..	-10	..	..	..	..	..
N. Zealand	*	239	1.7	2.1	0.13	12.7	0.16	22	..	..	..	..	..
Austria	*	125	0.6	0.4	..	2.1	0.02	2	-39	-70	..	-74	-76
Belgium	*	145	1.0	0.8	..	4.6	0.09	20	..	..	..	..	..
Czech Rep.	*	98	2.1	0.7	0.09	2.7	0.08	..	..	..	..	..	..
Denmark	*	134	1.3	0.7	0.08	3.9	0.08	-4	-27	-43	73	-59	-72
Finland		144	2.0	0.6	0.14	3.6	0.04	0	-30	..	-35	..	-82
France	*	125	1.2	1.1	..	5.4	0.13	7	..	..	..	-45	-12
Germany	*	129	0.8	0.4	0.04	2.6	0.03	..	..	..	..	..	..
Greece	*	187	1.6	2.2	..	8.5	0.31	31	-2	197	..	..	-68
Hungary	*	90	1.4	0.9	0.22	5.7	0.13	..	..	..	..	..	..
Iceland	*	188	5.7	1.8	..	9.9	0.54	18	4	-12	..	-14	-41
Ireland	*	131	1.3	1.5	..	7.0	0.16	-28	5	26	..	-52	-14
Italy	*	113	..	..	..	..	..	16	..	..	..	..	..
Luxembourg	*	344	..	..	..	..	..	33	..	..	..	..	..
Netherlands	*	141	1.1	0.5	0.07	1.9	0.10	8	-39	-60	-50	-68	-38
Norway	*	136	1.7	0.8	0.07	5.2	0.05	-10	-27	-40	-13	-57	-83
Poland		128	1.9	1.3	0.16	..	0.21	..	..	..	..	..	..
Portugal	*	138	2.1	0.9	..	8.0	0.18	33	49	27	..	..	29
Spain	*	158	1.5	1.1	..	5.8	0.25	19	..	..	..	..	..
Sweden	*	146	1.9	1.1	..	5.6	0.16	1	-28	..	..	..	-57
Switzerland		123	0.7	0.4	0.03	2.7	0.02	20	-36	-65	-26	-70	-77
Turkey		113	1.0	1.0	..	5.2	..	10	3	19	..	19	..
UK	*	141	1.2	0.7	0.05	4.0	0.08	1	-32	-42	-35	-74	-44
North America		236	1.5	..	..	..	0.10	-14	..	..	..	..	..
OECD Europe	*	131	1.2	..	..	..	0.12	..	..	..	..	..	..
EU-15	*	133	1.2	..	..	..	0.12	..	..	..	..	..	..
OECD	*	174	1.2	..	..	..	0.13	..	..	..	..	..	..

** See Annex 1 for data sources, notes and comments.*

AIR POLLUTION

Road transport-related air emissions - emission intensities per vehicle-km

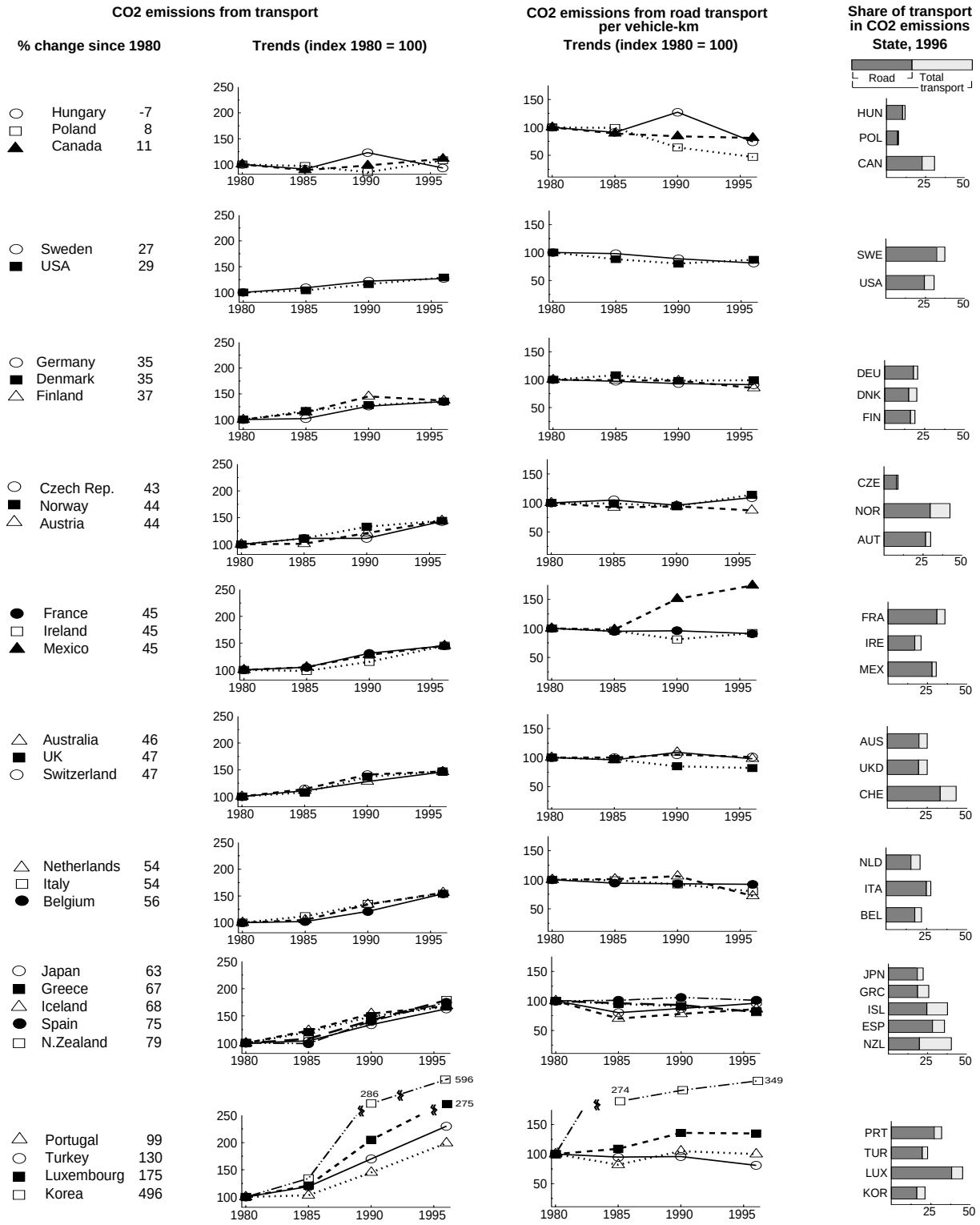


		Road transport emissions per unit of traffic volume , mid-1990s tonne / million vehicle-km						, change since 1980 %					
		CO2	NOx	VOC	Part.	CO	SOx	CO2	NOx	VOC	Part.	CO	SOx
Canada	*	399	2.2	1.7	0.42	17.2	0.15	-19	..	..	..	..	..
Mexico	*	1762	..	..	..	..	..	74	..	..	..	..	..
USA	*	363	1.9	1.6	0.08	14.9	0.08	-13	-40	-54	-48	-50	-61
Japan		314	0.8	..	..	..	..	-4	-61	..	..	..	..
Korea	*	1159	9.9	..	1.58	17.8	0.74	249	..	..	..	..	..
Australia	*	348	..	..	..	..	..	-2	..	..	..	..	..
N. Zealand	*	234	..	..	0.21	..	..	-19	..	..	..	..	..
Austria	*	298	..	..	..	..	..	-13	..	..	..	..	..
Belgium	*	233	1.9	1.7	0.10	9.7	0.18	-28	..	..	..	..	..
Czech Rep.	*	323	5.8	2.2	0.17	8.0	0.19	9	..	..	..	..	-85
Denmark	*	261	1.9	1.5	0.10	8.6	0.04	-1	-28	-51	..	-66	-84
Finland		241	3.0	1.1	0.18	6.8	0.03	-15	-42	-35	-47	-53	-92
France	*	254	2.2	2.3	0.21	12.1	0.28	-9	-25	..	53	-13	..
Germany	*	290	1.6	0.9	0.07	6.2	0.05	-9	..	..	..	..	..
Greece	*	276	2.5	..	..	..	0.18	-18	..	..	..	..	..
Hungary	*	208	3.1	..	0.55	15.0	0.31	-26	..	..	..	..	..
Iceland	*	344	3.8	4.8	..	26.6	0.14	-14	-9	-13	..	-14	-5
Ireland	*	217	..	..	..	..	..	-8	..	..	..	..	..
Italy	*	230	..	..	..	..	..	-20	..	..	..	..	..
Luxembourg	*	762	..	..	..	..	..	35	..	..	..	..	..
Netherlands	*	265	2.0	1.2	0.10	4.5	0.10	-8	-49	-64	-67	-72	-52
Norway	*	335	2.3	2.2	0.14	15.9	0.06	14	-26	-33	4	-50	-75
Poland		220	..	2.0	..	..	..	-53	..	-71	..	..	..
Portugal	*	270	4.1	2.0	..	18.9	0.29	0	17	-4	..	..	-15
Spain	*	450	4.1	3.9	..	21.4	0.53	1	-28	-32	..	-47	-34
Sweden	*	278	1.9	1.9	..	10.9	0.01	-19	-53	..	..	-66	-95
Switzerland		281	1.5	1.0	0.05	6.1	0.03	1	-52	-74	-49	-78	-81
Turkey		802	..	..	..	..	..	-19	..	..	..	..	..
UK	*	262	2.2	1.5	0.12	7.6	0.09	-18	-44	-54	-48	-68	-50
North America		385	..	..	..	..	..	-11	..	..	..	..	..
OECD Europe	*	278	..	..	..	..	..	-13	..	..	..	..	..
EU-15	*	272	..	..	..	..	..	-12	..	..	..	..	..
OECD	*	343	..	..	..	..	..	-10	..	..	..	..	..

** See Annex 1 for data sources, notes and comments.*

AIR POLLUTION

Trends in CO_2 emissions from transport



RISK AND SAFETY

POLICY RELEVANCE

Accident risks mainly arise from the daily operation of transport modes. Certain risks such as those caused by the transport of hazardous waste by road or rail, or by the accidental discharge of oil products by tankers raise concern because of the potential scale and intensity of the damage. Although disastrous accidents in rail, water and air transport occasionally result in heavy tolls, taken together, these generally represent only a small fraction of the deaths, injuries and property damage attributable to road transport.

Road accidents represent high social costs. These costs relate to material damage and to injuries or deaths; they include medical costs, "value of life", etc. The number of people killed or injured allows a partial but readable expression of this cost. As most casualties occur in conjunction with road transport, the indicator is confined to this transport mode.

Road safety is determined by numerous factors, such as the volume of traffic, the state of vehicles, the state and capacity of infrastructure, behaviour of drivers, etc. Although road safety is not considered a traditional environmental goal per se, it often converges with environmental goals and has important social and health implications.

THE INDICATORS

The indicators presented here relate to:

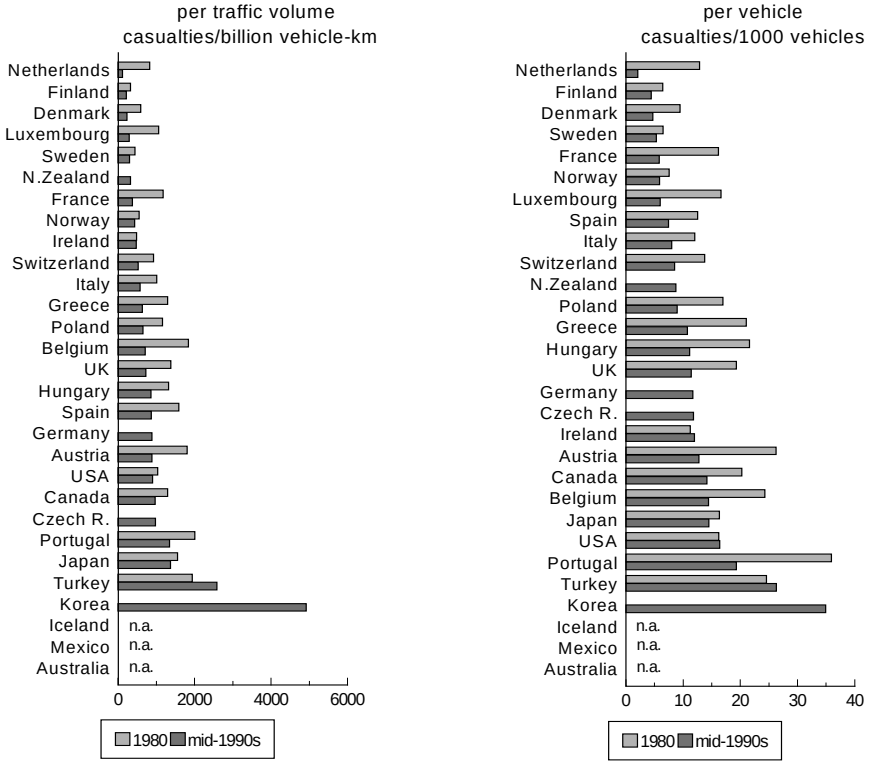
- The number of road casualties (i.e. people killed or injured) and related changes.
- The number of victims per volume of traffic (per billion vehicle-km) and related changes.
- The number of victims per motor vehicle and related changes.

These indicators should be read in connection with indicators on traffic and transport volumes and on road infrastructure.

They should further be complemented with indicators on hazardous materials transported by the different transport modes, and data on transport accidents involving hazardous substances. Other useful information includes public expenditure on road security and working conditions in the road freight transport sector.

RISK AND SAFETY

Road traffic accidents



		Number of casualties (killed & injured)			per traffic volume			per vehicle		
		1000 casualties	% Change		casualties / 10^9 veh.-km	% Change		casualties / 1000 vehicles	% Change	
		mid-1990s	'70-'80	'80 - mid-90s	mid-1990s	'70-'80	'80 - mid-90s	mid-1990s	'70-'80	'80 - mid-90s
Canada		248	..	-8	976	..	-25	14	..	-30
Mexico		..	..	..	..	..	..	..	..	..
USA		3257	24	28	912	-9	..	16	-14	1
Japan		952	-39	57	1380	-65	-12	15	-72	-11
Korea		259	..	..	4932	..	..	35	..	..
Australia		..	..	..	..	..	..	..	..	..
N. Zealand		17	..	..	331	..	..	9	..	..
Austria		50	-11	-22	892	-45	-51	13	-52	-51
Belgium		68	-21	-19	721	-43	-61	15	-47	-40
Czech Rep.		39	..	..	989	..	..	12	..	..
Denmark		10	-41	-35	246	-48	-59	5	-52	-50
Finland	*	10	-47	8	227	-62	-33	4	-69	-31
France		178	2	-49	381	-32	-68	6	-32	-64
Germany		502	-7	-2	891	..	..	12	..	..
Greece		34	4	26	645	-53	-51	11	-72	-49
Hungary		25	-20	-1	869	-67	-35	10	-66	-48
Iceland		..	..	..	..	..	..	..	..	..
Ireland		14	-8	52	485	-46	-1	12	-49	6
Italy		264	-3	14	583	-37	-43	8	-44	-34
Luxembourg		1	-5	-43	297	-35	-72	5	-34	-64
Netherlands	*	13	-18	-78	122	-44	-85	2	-52	-84
Norway		12	-14	16	441	-50	-21	6	-49	-22
Poland		78	38	49	656	-59	-44	9	-65	-47
Portugal		67	43	54	1354	-37	-33	19	-34	-46
Spain		130	30	15	881	-36	-45	8	-52	-40
Sweden		21	-15	6	310	-33	-31	5	-32	-17
Switzerland		27	-11	-19	537	-34	-42	8	-45	-38
Turkey		106	38	269	2594	-43	33	26	-65	7
UK		320	-10	-5	734	-33	-47	11	-29	-41

** See Annex 1 for data sources, notes and comments.*

PRICING AND TAXATION

POLICY RELEVANCE

Pollution, accidents and congestion cause a number of negative environmental and social side effects leading to external costs which are not sufficiently taken into account in transport prices. Internalisation of external (social) costs through the use of economic and or regulatory instruments is considered a key element of policies aimed at fostering sustainable development.

Prices play a major role as an instrument of information and are important determinants of consumer behaviour. Thus, fuel prices which rise relative to other goods tend to reduce demand for fuels, stimulate energy saving and may influence the fuel structure of energy consumption.

Governments exert a major influence on the level of energy prices through measures of taxation. Environmental objectives have not usually been a driving force behind the elaboration of the often complex fiscal structure of energy products in OECD countries: fuel taxation was developed primarily to raise revenue and to reduce energy dependency. However, the use of fiscal instruments to internalise environmental costs is being increasingly considered by Member countries.

THE INDICATORS

The indicators presented here relate to:

- Road fuel prices and taxes, notably the price in US$ per litre (at 1991 prices and PPPs) and related taxation levels (in percent of price) for diesel fuel, leaded gasoline and unleaded gasoline.

Depending on the use of this indicator, prices could also be expressed in US$ at 1991 prices and exchange rates.

These indicators should be read in connection with indicators on energy use by road transport and on road traffic volumes.

They should further be complemented with data on other taxes and charges (e.g. vehicle taxes, user charges), on transport subsidies and on environmental expenditure related to transport (e.g. expenditure on clean vehicles, clean fuels).

PRICING AND TAXATION

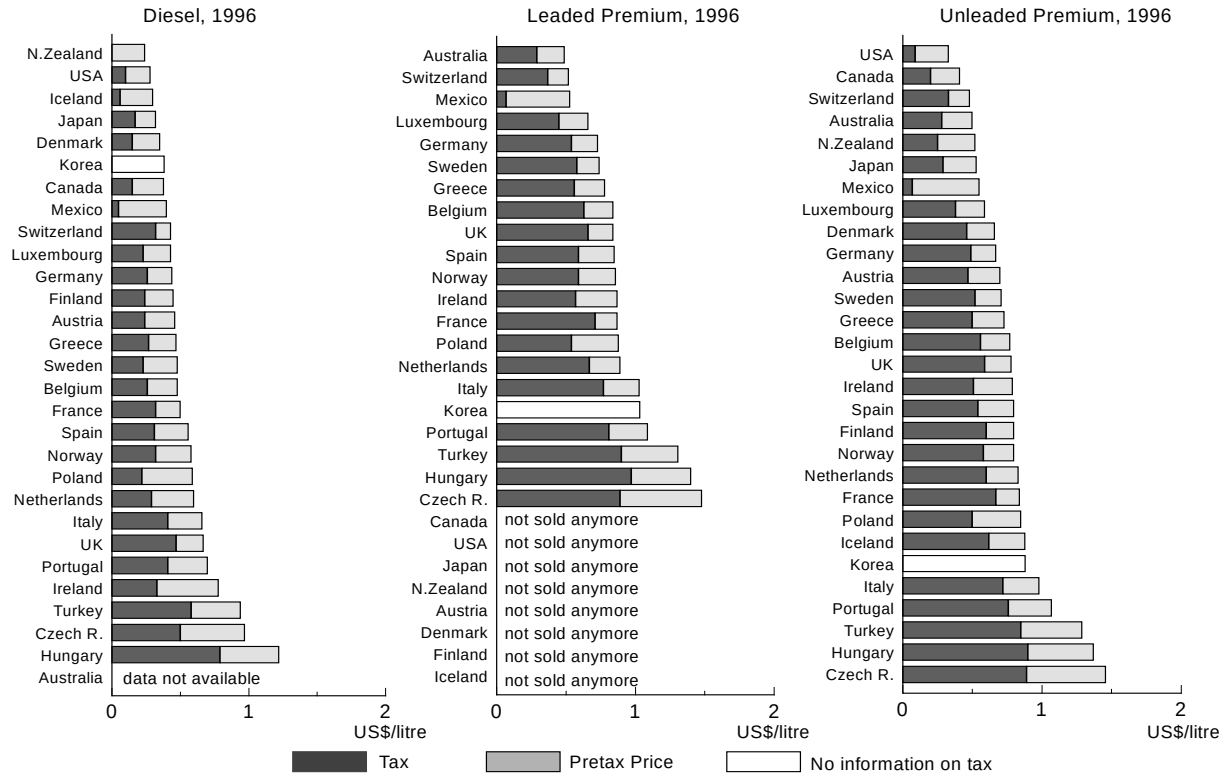
Road fuel prices and taxes

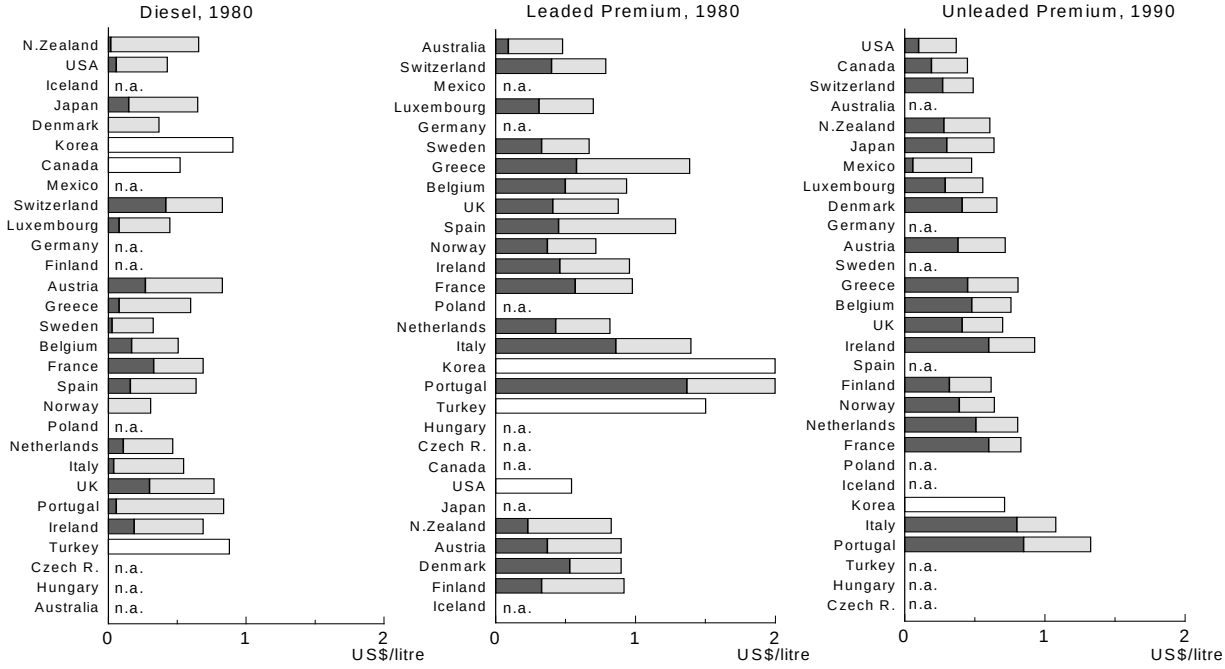
		Diesel fuel (a)						Leaded premium						Unleaded premium (b)					
		Price US$/litre (d)			Taxation (c) % of price			Price US$/litre (d)			Taxation (c) % of price			Price US$/litre (d)			Taxation (c) % of price		
		1980	1990	1996	1980	1990	1996	1980	1990	1996	1980	1990	1996	1980	1990	1996	1980	1990	1996
Canada	*	0.52	0.40	0.38	..	34	40	..	..	n.app.	..	..	n.app.	0.34	0.46	0.42	25	42	49
Mexico	*	..	0.32	0.40	..	13	13	..	0.37	0.53	..	13	13	..	0.49	0.55	..	..	13	13
USA	*	0.44	0.32	0.29	15	28	36	0.55	..	n.app.	..	..	n.app.	0.63	0.37	0.33	..	27	27
Japan	*	0.66	0.38	0.32	24	36	53	..	..	n.app.	..	..	n.app.	0.95	0.64	0.54	37	47	54
Korea	*	0.91	0.33	0.38	..	..	..	3.60	..	1.03	..	..	..	2.57	0.71	0.88	..	..	..
Australia		..	0.24	..	..	19	..	0.48	0.49	0.50	19	45	59	..	..	0.50	..	..	55
N.Zealand	*	0.65	0.36	0.25	2	21	1	0.83	0.62	n.app.	28	46	n.app.	..	0.61	0.52	..	46	48
Austria		0.82	0.53	0.47	33	45	52	0.90	0.75	n.app.	42	56	n.app.	..	0.72	0.70	..	53	67
Belgium		0.52	0.46	0.48	34	47	54	0.95	0.80	0.84	53	65	75	..	0.75	0.77	..	63	73
Czech Rep.		..	..	0.97	..	55	51	..	..	1.49	..	72	60	..	..	1.45	..	68	61
Denmark	*	0.37	0.21	0.35	0	0	44	0.90	0.70	n.app.	59	69	n.app.	..	0.65	0.67	..	62	70
Finland		..	0.60	0.45	..	59	54	0.93	0.68	n.app.	36	55	n.app.	..	0.63	0.80	..	51	75
France	*	0.69	0.47	0.50	47	57	64	0.98	0.85	0.87	58	74	81	..	0.83	0.84	..	73	80
Germany		..	..	0.44	..	..	59	..	..	0.72	..	..	74	..	..	0.67	..	..	74
w.Germany		0.66	0.43	..	41	51	..	0.76	0.64	..	49	63	..	..	0.59	..	..	60	..
Greece		0.60	0.36	0.48	13	27	57	1.40	0.85	0.79	42	64	72	..	0.81	0.73	..	55	68
Hungary		..	..	1.22	..	18	65	..	..	1.40	18	52	70	..	..	1.37	..	..	66
Iceland	*	..	..	0.30	..	..	20	..	..	n.app.	..	..	n.app.	..	..	0.88	..	..	70
Ireland		0.69	0.66	0.79	28	51	42	0.96	0.96	0.87	48	67	66	..	0.93	0.79	..	65	65
Italy		0.55	0.60	0.66	8	60	62	1.41	1.09	1.03	61	75	75	..	1.07	0.98	..	74	73
Luxembourg		0.45	0.34	0.43	17	33	54	0.70	0.59	0.66	44	49	68	..	0.56	0.59	..	52	65
Netherlands		0.47	0.44	0.60	23	43	48	0.82	0.85	0.89	52	64	75	..	0.81	0.83	..	62	72
Norway		0.31	0.25	0.58	1	15	55	0.72	0.69	0.87	52	64	68	..	0.63	0.80	..	61	72
Poland		..	0.70	0.59	..	30	37	..	0.92	0.88	..	41	62	..	..	0.85	..	..	59
Portugal		0.84	0.88	0.69	7	52	59	2.24	1.40	1.09	61	68	74	..	1.34	1.07	..	64	71
Spain		0.64	0.54	0.56	25	49	55	1.29	0.80	0.85	35	63	69	..	..	0.80	..	..	67
Sweden		0.33	0.43	0.48	8	27	49	0.67	0.70	0.74	49	65	79	..	..	0.71	..	..	74
Switzerland		0.82	0.51	0.42	51	59	75	0.79	0.52	0.52	51	59	71	..	0.48	0.48	..	55	69
Turkey		0.88	1.06	0.94	..	55	61	1.51	1.14	1.30	..	53	69	..	..	1.30	..	..	66
UK		0.77	0.59	0.67	40	53	70	0.88	0.75	0.84	46	62	79	..	0.71	0.77	..	58	76

** See Annex 1 for data sources, notes and comments.*

PRICING AND TAXATION

Fuel prices and taxes





ANNEX 1 MEASURED INDICATORS - TECHNICAL ANNEX

GENERAL INFORMATION

Country region codes used are as follows:

CAN:	Canada	FIN:	Finland	NOR:	Norway
MEX:	Mexico	FRA:	France	POL:	Poland
USA:	United States	DEU:	Germany	PRT:	Portugal
JPN:	Japan	wDEU:	western Germany	ESP:	Spain
KOR:	Korea	GRC:	Greece	SWE:	Sweden
AUS:	Australia	HUN:	Hungary	CHE:	Switzerland
NZL:	New Zealand	ISL:	Iceland	TUR:	Turkey
AUT:	Austria	IRL:	Ireland	UKD:	United Kingdom
BEL:	Belgium	ITA:	Italy	TOT:	regional totals
CZE:	Czech Republic	LUX:	Luxembourg	DAC:	OECD Development Assistance Committee Member countries
DNK:	Denmark	NLD:	Netherlands		

*: Data including western Germany only

➢ **Country aggregates**

OECD: All OECD Member countries, which include the OECD Europe — i.e. countries of the European Union (EU) plus Czech Republic, Hungary, Iceland, Norway, Poland, Switzerland and Turkey — plus Canada, Mexico, the United States, Japan, Korea, Australia and New Zealand.
OECD* All OECD Member countries except eastern Germany.
OECD** Partial OECD total.

➢ **Signs**

..; n.a.	not available	.	decimal point	%	percentage
-	nil or negligible	n. app.	not applicable	$	US dollar

➢ **Per capita values**

All per capita information uses OECD and Food and Agriculture Organization (FAO) population data.

➢ **Per unit of GDP values**

All per unit of GDP information uses OECD GDP data at 1991 prices and purchasing power parties (PPPs). The use of PPPs appears preferable to the use of exchange rates in conjunction with environmental questions, as the objective of comparing measures of economic activity such as GDP is to reflect underlying volumes and physical processes as closely as possible.

PPPs are defined as the ratio between the amount of national currency and the amount of a reference currency needed to buy the same bundle of consumption goods in the two countries. In this publication, the reference currency is US$. Typically, PPPs differ from exchange rates as the latter reflect not only relative prices of consumer goods but also a host of other factors, including international capital movements, interest rate differentials and government intervention. As a consequence, exchange rates exhibit much greater variations over time than PPPs.

TRAFFIC

PASSENGER TRANSPORT BY MODE

Data sources: ECMT, OECD, IRF, national statistical yearbooks

(a) ➢ Share with respect to ('Rail' + 'Private Cars' + 'Bus and Coaches')
Can ➢ 1995 data refer to 1994 except rail.
USA ➢ Buses and coaches: intercity and school buses.
NZL ➢ 1980 data refer to 1978
BEL ➢ Break in time series around 1990.
wDEU ➢ 1980 private cars refer to 1981.

FREIGHT TRANSPORT BY MODE

Data sources: ECMT, OECD, IRF, national statistical yearbooks

(a) ➢ Share with respect to ('Rail' + 'Roads' + 'Inland Waterways')
CAN ➢ Roads include for-hire only. Inland waterways: data refer to domestic maritime transport.
USA ➢ 1980 Waterways datum reflects start up between 1975 and 1980 of Alaska pipeline and consequent water transport of crude petroleum from Alaskan ports to mainland U.S. for refining. Includes coastal shipping.
JPN ➢ Includes coastal shipping.
KOR ➢ Includes coastal shipping.
BEL ➢ Internal & international transport (exports, imports). Transit by Belgian vehicles with a load.
FRA ➢ Road: traffic of vehicles >= 3T; inland waterways: excluding rhine transit.

ROAD TRAFFIC VOLUMES AND INTENSITIES

♦ Traffic volumes are expressed in billions of kilometres travelled by road vehicle; they are usually estimates and represent the average annual distance covered by vehicles, in kilometres, multiplied by the number of vehicles in operation. In principle, the data refer to the whole distance travelled on the whole network inside the national boundaries by national vehicles, with exception of two- and three-wheeled vehicles, caravans, and trailers.

TOTAL MOTOR VEHICLES

Data sources: OECD, IRF, national statistical yearbooks

a) ➢ Data include Secretariat estimates.
b) ➢ Includes provisional data.
USA ➢ Traffic by local and urban buses is excluded.
JPN ➢ Traffic by light vehicles is excluded.
CZE ➢ Excludes buses (11.8 billion veh-km in 1996).
FRA ➢ Traffic by buses of the Régie Autonome des Transports Parisiens is excluded.
wDEU ➢ Except for caravans and large trailers hauled by passenger-carrying vehicles, traffic by special vehicles is included. 1996: 1995 data.
GRC ➢ Data refer to inter-city traffic only.
ISL ➢ Traffic by local and urban buses is excluded.
ITA ➢ Traffic by three-wheel goods vehicles is included.
NLD ➢ Traffic by trams and subways is included.
ESP ➢ Data refer only to traffic on motorways and national roads.

SWE ➢ Data include traffic by Swedish passenger cars abroad. Traffic by goods vehicles with a load capacity under 2 tonnes is excluded. Up to 1988, only the public network is included; after 1989, the total network is taken into account.
TUR ➢ Data refer only to traffic on motorways and national roads.
UKD ➢ Data refer to Great Britain only.

PASSENGER CARS AND GOODS VEHICLES

Data sources: OECD, IRF, national statistical yearbooks

a) ➢ Data include Secretariat estimates.
b) ➢ Includes provisional data.
JPN ➢ Traffic by light vehicles is excluded.
FRA ➢ Excludes goods vehicle over 15 years old . Road: traffic of goods vehicles >= 3T
wDEU ➢ Passenger traffic: except for caravans and large trailers hauled by passenger-carrying vehicles, traffic by special vehicles is included. Goods traffic refer to semi-trailer tractors only. 1996: 1995 data.
GRC ➢ Data refer to inter-city traffic only.
ITA ➢ Goods taffic by three-wheel goods vehicles is included.
ESP ➢ Data refer only to traffic on motorways and national roads. Traffic by goods vehicles includes agricultural tractors.
SWE ➢ Passenger traffic data include traffic by Swedish passenger cars abroad. Up to 1988, only the public network is included; after 1989, the total network is taken network is taken into account. Goods traffic refers with load capacity > 3.5 tonnes.
TUR ➢ Data refer only to traffic on motorways and national roads.
UKD ➢ Data refer to Great Britain only.

INFRASTRUCTURES

ROAD AND RAIL NETWORK LENGTH AND DENSITY

Data sources: IRF, OECD, UN-ECE, national statistical yearbooks, UIC

- Network length refer to motorways, main or national highways, secondary or regional roads, and others. In principle, the data refer to all public roads, streets and paths in urban and rural areas, but not private roads.

a) ➢ As of 31st December. Data include Secretariat estimates.
b) ➢ Includes provisional data.
c) ➢ As of 31st December.
MEX ➢ Motorways are considered as toll roads.
USA ➢ Definitions were changed in the early 1980s.
AUT ➢ Est. 100 000 km private roads not included.
FIN ➢ Urban streets are excluded.
FRA ➢ Road network: excludes certain rural roads (700 000 km in 1987). Motorways: of which about 1 200 km are urban motorways.
DEU ➢ Rail: until 1990 Deutsche Bundesbahn only; from 1991 includes Deutsche Reichsbahn; from 1994 Deutsche Bahn AG.
GRC ➢ Figures are based on motorways, main or national roads, and secondary or regional roads. Excludes other roads estimated at 75 600 km in 1995.
ESP ➢ Road network: include motorways, national roads and secondary roads only. Excludes other roads estimated at 175 000 km in 1995. Motorways include certain two land roads.
SWE ➢ Private roads are excluded. Motorways exclude access and exit ramps.
TUR ➢ National and provincial roads only. Village roads are excluded (320 055 km in 1995).
UKD ➢ For all roads and motorways, data refer to Great Britain only. For motorways, slip roads are not included. Rail : as of 31st March.
OECD-Europe, EU-15)
Rail total: DEU is excluded.

VEHICLES

ROAD VEHICLE STOCKS AND INTENSITIES

Data sources: OECD, AAMA, IRF

- Total stock of motor vehicles includes passenger cars, goods vehicles, buses and coaches. Data refer to autonomous road vehicles with four or more wheels, excluding caravans and trailers, military vehicles, special vehicles (for emergency services, construction machinery, etc.) and agricultural tractors.
- Passenger car ownership is expressed as passenger cars per capita. Data refer to passenger cars seating not more than nine persons (including the driver), including rental cars, taxis, jeeps, estate cars/station wagons and similar light, dual-purpose vehicles.

a) ➢ Data as of 31st December. Data include Secretariat estimates.
b) ➢ Includes provisional data.
JPN ➢ Three-wheeled vehicles are included in motor vehicle stock and goods vehicle stock.
AUS ➢ Passenger vehicle stock includes utility vehicles. Goods vehicle stock includes buses and coaches.
AUT ➢ Passenger vehicle stock includes Kombi.
BEL ➢ Figures are reported on 1st August of the reference year. Road tractors are included in motor vehicle stock. Goods vehicle stock includes road tractors.
DNK ➢ Passenger cars includes vans under 2 tonnes.
FRA ➢ Figures are reported on 1st January.
DEU ➢ Tractors are included in motor vehicle stock. Passenger vehicle stock includes "Kombinations-kraftwagen". Goods vehicle stock includes buses and coaches and tractors.
wDEU ➢ 1996: 1995 data.
LUX ➢ Method of calculation changed between 1975 and 1980. Figures are reported on 1st January.
NLD ➢ Figures are reported on 31st July of the reference year.
POL ➢ Motor vehicle stock includes road tractors. Goods vehicle stock includes road tractors.
PRT ➢ The definition of commercial vehicles changed in 1990. Goods vehicle stock includes buses and coaches.
CHE ➢ Figures are reported on 30th September of the reference year. Passenger vehicle stock includes station cars.
UKD ➢ Motor vehicle stock and goods vehicle stock include special purpose vehicles.
OECD-Europe, EU-15, OECD)
% changes in per unit of GDP are calculated based on partial totals.

STRUCTURE OF ROAD VEHICLE FLEET

Data sources: ECMT, OECD, AAMA, IRF.

See also notes on road vehicle stocks and intensities.

a) ➢ Data as of 31st December.
b) ➢ Includes cars and taxis.
c) ➢ Includes provisional data.
DEU ➢ Vehicle stocks by type of fuel: data as at 1st July; passenger vehicles stock by fuel types refers to cars only; since 3 October 1990, including new "Lander".
wDEU ➢ 1996: 1995 data.
ITA ➢ Goods vehicle stock includes > 1.9 t. only

ENERGY USE

FINAL ENERGY CONSUMPTION BY THE TRANSPORT SECTOR

- Exclude international marine bunkers.

Data source : OECD-IEA

CONSUMPTION OF ROAD FUELS

Data source: OECD-IEA

- All fuels used in road vehicles (including military) as well as agricultural and industrial highway use; excludes motor gasoline used in stationary engines, and diesel oil in tractors that are not for highway use.
- Total includes natural gas, liquefied petroleum gases, kerosene, heavy fuel oil and other petroleum products.

AIR POLLUTION

Data sources: IEA - OECD.

CO_2 emissions

- Data refer to CO_2 emissions from transport fossil fuel combustion and to 1996.

NOx, VOC, Particules, CO and SOx emissions

- Data refer to man-made emissions only.
- VOCs data: other than methane(CH4) emissions.
- % of total emissions: emissions from international transport (aviation and marine) are excluded.
- Data may include provisional figures and Secretariat estimates.
- Mid-1990s: data refer to 1996 or to the latest available year from 1993 on.

CAN ➢ SOx: SO2 only. VOC: total VOCs.
MEX ➢ SOx: SO2 only.
USA ➢ SOx: SO2 only. CO: emissions from fugitive dust, prescribed burning and other fires are excluded (these emissions amounted to 5 154 kt/y in 1995). VOC: emissions from fugitive dust, prescribed burning and other fires are excluded (estimated at 309 kt/y in 1995). Particulates: data refer to PM10; emissions from fugitive dust, prescribed burning and other fires are excluded (these emissions amounted to 37 328 kt/y in 1995).
KOR ➢ SOx: SO2 only. NO_x: NO_2 only.
AUS ➢ Data are from Australia's National Greenhouse Gas Inventory.
NZL ➢ SOx: SO2 only.
AUT ➢ SOx: SO2 only. Data refer to "Umweltbundesamt, UNFCCC 98" (IPCC 1995 guidelines).
BEL ➢ NOx, Sox: early 1980s data are from UNECE.
CZE ➢ SOx: SO2 only.
DNK ➢ Data based on the Danish CORINAIR inventories and UNECE format. VOC: data before 1985 exclude emissions from the use of solvents.
FRA ➢ Sox, Nox, VOC and CO: change in estimation methodology in 1990. Particulates: data exclude mobile sources other than road transport.
DEU ➢ Mid-1990s: provisional data.
wDEU ➢ Mid-1990s: provisional data.
GRC ➢ VOC: break in time series in 1990.
HUN ➢ SOx: SO2 only. VOC and CO: 1980 data are estimates. Particulates: data refer to PM10.
ISL ➢ Data refer to the IPCC 1995 methodology. Early 1980s: 1982 data. % change refers to the period 1982-96. SOx: SO2 only. CO: emissions from industrial processes are excluded.
IRE ➢ SOx, Nox, VOC: data for totals exclude emissions from industrial processes. VOC and CO: changes in the estimation methodology between 1980 and 1990.
ITA ➢ Particulates early 1980s: data exclude industrial processes.
LUX ➢ VOC: total VOCs.
NLD ➢ SOx, Nox, VOC and CO: estimation methodology changed in 1990. Particulates: data refer to PM10.
NOR ➢ Particulates: data refer to PM10.
PRT ➢ SOx, Nox:, VOC break in time series in 1990; change in estimation methodology. SOx, NOx and CO: since 1990 data include Madeira and Azores Islands.
ESP ➢ Break in time series in 1990 (CORINAIR 90). Sox early 1980s: Secretariat estimates. VOC early 1980s: exclude industrial fuel combustion and industrial processes.
SWE ➢ Data include international bunkers for aviation and shipping. SOx: SO2 only. Nox: NO2 only. VOC, CO mid 1990s: data refer to FCCC 1997. VOC: total VOCs.
UKD ➢ SOx: SO2 only. Particulates: data refer to PM10.
TOT ➢ Data include Secretariat estimates.

RISK AND SAFETY

Data source : OECD, ECMT, national reports

ROAD TRAFFIC ACCIDENTS

FIN) Change in the series in 1995
NLD) Change in the series in 1990

PRICING AND TAXATION

ROAD FUEL PRICES AND TAXES

Data sources: IEA - OECD.

- see IEA (1998), *Energy Prices and Taxes, Second Quarter*
- Taxes: includes taxes that have to be paid by the consumer as part of the transaction and are not refundable.
- Diesel fuel: diesel for commercial use.
- Unleaded gasoline: unleaded premium (95 RON) except as noted.
- Prices: expressed in US$ at 1991 prices and PPPs.

CAN ➢ Diesel: 1980 data refer to 1981. Unleaded gasoline: unleaded regular (92 RON).
MEX ➢ Unleaded gasoline: unleaded regular (92 RON).
USA ➢ Diesel: for non-commercial use. Unleaded gasoline: 1980 data refer to 1981.
JPN ➢ Unleaded gasoline: unleaded regular (91 RON).
KOR ➢ 1980 data refer to 1981.
NZL ➢ Unleaded gasoline: unleaded regular (91 RON).
DNK ➢ Unleaded gasoline: unleaded premium (98 RON).
FRA ➢ Up to February 1985 prices were kept within a set range. Figures before 1985 refer to maximum price for Paris. Figures after 1985 refer to average price for all of France.
ISL ➢ Data from Statistics Iceland.

ANNEX 2
ECMT RESOLUTIONS

ECMT RESOLUTION NO. 66 ON TRANSPORT AND THE ENVIRONMENT

[CM(89)29 Final]

The Council of the European Conference of Ministers of Transport meeting in Paris on the 23rd of November 1989:

CONSIDERING

- That good transport systems play a major positive role in the economies of all countries and in the lives of their citizens;
- That there exist growing environmental problems, globally, regionally and locally, for which the transport sector, inter alia, bears a significant responsibility;
- That emerging scientific evidence points to the seriousness of the problems and gives an urgency to the need for action;

NOTING

- That in most countries the number of journeys made, especially journeys by road, increased significantly during the last two decades and moreover is expected to increase further due to improved living standards and the expansion of international trade;
- That the need for improved and more efficient transport facilities in the future and the growing environmental problems caused poses new challenges for transport policy-making which could lead to significant changes in orientation towards alternative solutions.
- That technical concepts for clean and quiet vehicles exist and State and local programmes are under development in different countries to encourage the introduction of such vehicles, especially in the city areas.

AWARE

- That, in principle, transport users should have a free choice of mode;
- That a series of recent conferences and meetings, at the highest political levels, have emphasised the extent of environmental problems, especially global problems;
- That the World Commission on Environment and Development set up by the United Nations has recommended sustainable development as the basic guideline for all economic activities;
- That within the Convention on Long-Range Transboundary Air Pollution it has been agreed in the framework of the United Nations Economic Commission for Europe (ECE) to freeze by 1994 the amount of nitrogen oxide emissions at the 1987 level and that eleven ECMT member countries have declared their intention to go further and reduce this level by 30 per cent by 1998 compared with a base year between 1980 and 1986;
- That international harmonised standards concerning, inter alia, motor vehicle emissions and noise, as well as machinery for their continuous updating already exist, in particular within the ECE Working Party 20.
- That measures which reduce environmental damage may also improve road safety;
- That energy, emission and pollution issues are also closely linked, and that certain improvements in energy efficiency may produce environmental benefits.

STATES

- That the impacts of transport on human health and the environment must be limited to levels which human beings and nature can cope with in the long run;
- That both international and national measures are needed to obtain concrete results which can reduce rapidly the seriousness of the situation, taking account also of long term needs;
- That the harmful impacts of transport on the environment can most effectively be reduced if measures affecting vehicles, traffic and infrastructure are implemented in combination;
- That the responsibility for an environmentally acceptable transport system is shared by the vehicle and fuel industries as well as national and subnational authorities and transport users;
- That, although many countries and international organisations have taken various important steps towards reducing the exhaust and noise emissions especially from the road transport sector, further steps are necessary;
- That measures must be undertaken within a framework of clear-cut environmental policy goals which should be translated into quantified emission reductions and plans for the transport sector in the medium and longer term;
- That environmental considerations should be analysed and taken into account as far as possible in all proposals relating to transport policy.

RECOMMENDS

A. IN RELATION TO VEHICLES

i) Vehicle Emission Controls

- That efforts should be made to strengthen and harmonise emission controls, including emission controls for diesel fuels paying particular attention to those which come into force in the United States for the model year 1994, on as wide a geographical basis as possible and at the levels adopted by the most advanced countries;
- That best available technology to reduce noise and air pollution emissions and improve energy efficiency should be applied to the maximum extent that is practically possible at an acceptable cost;
- That vehicle manufacturers take practical steps to develop vehicles that are less performance oriented, and which are cleaner, quieter, safer and more energy efficient using materials that are reusable and which allow more environmentally friendly waste treatment;
- That research on environmentally friendly technologies should be encouraged and intensified; results should be shared internationally on a regular basis. In particular, a major international research effort is needed to develop a cleaner heavy duty engine especially with reduced particulate emissions, in which the manufacturers have an important role;

ii) Improving Environmental Performance of In-Use Vehicles

- That in general, environmental performance of in-use vehicles must be improved. To achieve this objective, a broad strategy should be applied including, as appropriate, the proper certification of vehicles, warranty recall mechanisms, durability conditions for anti-pollution devices, inspection and maintenance programmes, and better use of on-board diagnostics and devices to help drivers to drive and navigate efficiently;
- That in particular, intensive efforts need to be made to develop test methods or procedures for vehicle emission levels which are effective cheap and quick.

iii) Issues Concerning Fuels

- That efforts need to be made to improve the quality of diesel fuel, since it is relevant to emissions; ongoing work should be supported and encouraged;
- That there is a need for measures to control evaporative emissions of gasoline at bulk terminals, in gasoline trucks, and at the delivery service stations as well as for further study of the losses from gasoline-driven vehicles and fuel delivery systems;
- That research on the costs, pollution effects, and efficient use of alternative fuels and electric propulsion should be intensified;
- That, where they have not yet done so, Governments should encourage the more rapid and widespread introduction of unleaded fuel, by measures including the use of fiscal incentives and information campaigns.

iv) Motor Vehicles and Global Pollution Issues

- That Governments should review the use of taxes and/or regulations for motor vehicles to ensure their consistency with the goal of reducing fuel consumption and emissions;
- That, as a priority, a full range of possible measures that can be taken to reduce transport's contribution to the "greenhouse effect" be set out together with the costs and practical problems of implementing them;
- That the vehicle manufacturers should reduce the use of CFCs and it should be prohibited by the end of this century at the latest.

B. IN RELATION TO TRAFFIC MANAGEMENT

i) Generally

- That traffic management be used to further environmental objectives in transport policy, both in relation to demand management and in relation to changing modal split;
- That greater use be made of existing traffic management measures which can reduce the impact on the environment (such as traffic calming areas, traffic circulation plans, and, where appropriate, speed limits);
- That, since many users do not pay their full costs, it is necessary, in accordance with the Polluter Pays Principle, to introduce systems of supplementary charging for environmental damage caused. In principle, each transport mode should pay the full costs caused (for instance, through raising excise duty on fuels and/or road pricing). Methods of estimating such costs and ways of internalising them should be developed at international level.

ii) Urban Areas

- That traffic management measures should be applied in such a way as to encourage optimal use of alternative modes to the private car;
- That effective and acceptable means of reducing the use of the private car in urban areas need to be applied;
- That existing regulations should be better enforced, especially in relation to parking;
- That traffic management decisions need to include specific assessments of the land-use effects; public transport-based solutions need to be sought when new office or residential accommodation is constructed;
- That traffic management measures should be an integral part of the planning of urban areas as a whole;

- That research be done and experiments started on the ideal mix of measures that effectively stimulate car owners to use alternative modes.

iii) Inter-urban Traffic

- That ECMT resolutions on railways, inland waterways and combined transport be implemented rapidly so as to make these transport modes as efficient and commercially oriented as possible. In particular, improved co-operation at international level in railway operation is necessary;
- That efforts to develop the combined transport network and the attractiveness of its services be intensified;
- That any proposals to harmonise taxes and charges in international road freight transport should take into account the environmental damage caused by such traffic; the consistency and levels of such taxes and charges should also be systematically examined from and environmentally viewpoint

C. IN RELATION TO INFRASTRUCTURE

i) Evaluation Procedures and Practices

a) The Evaluation Process

- That infrastructure investment projects should include from the outset an assessment of the direct and indirect consequences for the environment as an integral part of the decision-making process;
- That assessments of infrastructure investment proposals should include traffic and environmental evaluations of the alternatives, including the alternatives based on extending railway or other public transport infrastructure and that of not building the infrastructure.

b) Consultation with the Public

- That consultation with the public should take place at intervals during the planning of the project especially when projects are not voted in the national parliament;
- That in such consultation the public should have access to detailed information on the project and be informed about possible realistic alternatives;

ii) Infrastructure Design

- That special efforts should be made in regard to choosing the route and also to minimise the adverse effects which occur in the vicinity of major transport interchanges; the possibilities in this regard should be reported on;
- That information should be exchanged internationally on environmental aspects of infrastructure design and construction (e.g. developments in noise-absorbing road surfaces, tunnel construction, protective screens, materials used, reduction of primary energy products in construction);
- That the attention of international organisations working in these areas should be drawn to the priority attached to these questions;
- That, in general, infrastructure construction should be undertaken using techniques and materials which reduce to the extent possible the adverse impacts on the environment, taking account of safety and cost constraints.

iii) Better Assessment of New Infrastructure Construction Needs

- That the modes which are environmentally friendliest should continue to be encouraged; that concrete steps, including the implementation of ECMT resolutions, which can be taken in this regard should be reported on regularly;
- That planning of new dwellings or offices should be based, to the extent possible, on existing or new public transport infrastructure systems.

FURTHERMORE, IN RELATION TO FUTURE ECMT WORK,

RECOMMENDS

- That, as a first step towards developing environmentally friendly vehicles, a Ministerial hearing with vehicle manufacturers and fuel industry should be organised;
- That the ECMT sets up a Working Body to help follow up the recommendations of this Session and to make other policy recommendations as appropriate. This working body should work in close co-operation with the OECD;
- That the conclusions of the Session should be communicated officially to the OECD, the UN and to the EC and other relevant bodies.

INSTRUCTS

The Committee of Deputies to report within two years on the implementation of this Resolution.

ECMT RESOLUTION NO. 98/1 ON THE POLICY APPROACH TO INTERNALISING THE EXTERNAL COSTS OF TRANSPORT

[CEMT/CS(98)7]

Ministers of Transport of the ECMT, meeting in Copenhagen, 26-27 May 1998:

REITERATING

- that adequate and efficient transport systems are of fundamental importance to the economies of all ECMT Member Countries and play an important role in the lives of their citizens;
- that there exist safety, health and environmental problems for which the transport sector bears a responsibility;
- that difficulties are increasingly apparent in meeting demand for mobility and funding infrastructure developments.

RECALLING

- that the Council of Ministers at Annecy in 1994 established an ad hoc Task Force on the Social Costs of Transport to clarify the issues in the debate on external costs, advise on methods of evaluation and develop appropriate policy options;
- that the 1996 ECMT Hearing of International Non-Governmental Organisations showed general support for the approach to managing the social costs of transport adopted by the Task Force;
- that the Berlin Council of Ministers of 1997 accepted the approach to internalising the external costs of transport set out in the report of the Task Force and called for the drafting of a resolution on policy toward the external costs of transport;
- that Ministers reiterated their support for further consideration of the application of the principle of internalising the external costs of transport in their 1997 Helsinki Declaration and at the 1997 UN/ECE Conference on Transport and Environment in Vienna;
- that the European Commission will make proposals on the development of instruments for reducing the social costs of transport on the basis of the 1996 report Towards Fair and Efficient Pricing in Transport;

CONSIDERING

- that significant welfare gains could be realised through reducing the external costs of transport efficiently and that internalisation aims to achieve this by factoring external costs into markets;
- that through more efficient management of resources and government expenditure, internalisation presents opportunities to reduce budget deficits, increase public spending and/or reduce taxes on labour and capital;
- that internalisation is a key element of policies aimed at fostering sustainable development;

AWARE

- that internalisation can be achieved without a net increase in taxation in the economy as a whole;
- that by improving economic efficiency internalisation can improve the competitive position of enterprise;
- that issues of equity (including the international dimension) need to be considered in developing internalisation policies. Equity issues can and should be addressed by a variety of flanking measures. In this way, internalisation can be made compatible with policies for regional cohesion;
- that the tax systems of many countries may already internalise some external costs, either as a result of overt policy or as a by-product of raising revenue through taxes specific to transport;
- that there are uncertainties in the estimation of external costs and in cost allocation, but these costs are certainly not zero and the lower bound estimates used as the basis for the accompanying report are unlikely to over-value external costs;
- that for some transport services with high external costs, internalisation is likely to lead to price increases but that internalisation should be based primarily upon structuring prices more efficiently, rather than increasing prices overall;
- that for those modes currently associated with high external costs, internalisation will, at the same time as improving efficiency, reduce growth in the volume of transport and any associated socio-economic benefits. However, a well designed policy package need have little impact on GDP and will result in an increase in net welfare when the value of safety and environmental benefits is taken into account.

NOTING

- that the potential for economic instruments to address the social costs of transport has been under-exploited;
- that tax increases that provide no incentive to reduce external costs do not contribute to internalisation;
- that regulations should be dynamic (tightened over time) in order to provide incentives for technological improvement, and that fiscal components of internalisation policy must take into account the expected benefits of such technological improvements;

– that economic indications of individual preference are the ideal basis for the valuation of external costs. However, where satisfactory valuations on this basis do not exist, agreed political targets (e.g. ambient air quality or exhaust emissions standards) are the most suitable basis for a practical internalisation strategy.

AGREE TO THE FOLLOWING PRINCIPLES

– that in the interests of improving economic efficiency, reducing the social costs of transport and increasing economic welfare, internalisation is an important transport policy objective;
– that full internalisation should be viewed as a long term objective, taking account of the wide gap that exists between the present structure of costs and prices in transport markets and the ideal in many countries (and particularly in some transition economies);
– that internalisation policies should be implemented through economic instruments and/or regulations, designed to provide effective incentives for reducing externalities while not resulting in a net increase in taxation in the economy as a whole;
– that Governments must co-operate to develop effective instruments for internalisation that do not discriminate between citizens or companies of different countries;
– that internalisation policies should not discriminate between different modes of transport or between transport and other sectors of the economy;
– that where public financial support for the provision of public goods is necessary, it should be provided, but only through transparent payments under contract;
– that internalisation policy should be implemented in a gradual step-wise manner in order to avoid economic shocks;
– that these gradual changes should be co-ordinated between modes to avoid shifts in modal split that would prove uneconomic in the long term.

RECOMMEND

– that Governments pursue opportunities to provide incentives for internalisation in the development of transport policy both in the context of EU legislation and in the framework of national legislation in all ECMT Member countries;
– that Governments develop economic instruments for the internalisation of transport externalities and that Ministers of Transport co-operate with Ministers of Finance in exploring the possibilities;
– that Governments align the structure of taxation more closely with costs, for example by moving towards more differentiated tax systems in transport and-making greater use of variable charges[21];
– that Governments progressively tighten fuel, emissions and safety standards cost-effectively to stimulate technical improvements towards lower social costs of transport;
– that Governments ensure that existing regulations are respected, notably in regard to social legislation;
– that where existing legislation related to the external costs of transport proves difficult to enforce, notably in the areas of road safety and environmental protection, regulations are reviewed with a view to rendering enforcement more practicable and effective;
– that special attention be given to reducing acute externalities, such as in urban areas, in the shorter term;
– that Governments ensure coherence in the valuation of costs and benefits, both private and external, used in project appraisals and environmental impact assessments and in developing both investment and internalisation policies;
– that Governments ensure that the electronic charging systems for using roads under development in a number of Member countries are compatible to a degree that minimises the costs of using such systems, avoids the need for individual vehicles to be equipped with several different systems and avoids the creation of delays at national frontiers;
– that Governments undertake appropriate public education measures to prepare the ground for the introduction of internalisation policies;
– that first steps towards a gradual and progressive internalisation of the external costs of transport be taken in individual Member countries as soon as possible.

INSTRUCT the Committee of Deputies

– to monitor the development of internalisation policies in ECMT Member Countries;
– and to report on progress towards the application of this Resolution within three years.

21. Italy entered a reservation in view of its concern that fiscal policy is not the remit of Transport Ministers.

REFERENCES

American Automobile Manufacturers Association *World Motor Vehicle Data*, Michigan, various issues.

ECMT *Trends in the Transport Sector*, various issues.

ECMT (1990) *Transport Policy and the Environment*, OECD, Paris.

ECMT (1998) *Statistical Trends in Transport*, Paris.

ECMT (1998) *Efficient Transport: Internalising Social Costs*, OECD, Paris.

IEA *Energy Prices and Taxes*, Paris, various issues.

International Road Federation, *World Road Statistics*, Geneva, various issues.

OECD (1991) *The State of the Environment*, Paris.

OECD (1991), *Environmental Indicators - A Preliminary Set*, Paris.

OECD (1993, 1999), *Indicators for the Integration of Environmental Concerns into Transport Policies*, Paris

OECD (1993, forthcoming), *Indicators for the Integration of Environmental Concerns into Energy Policies*, Paris

OECD (1993), *OECD Core Set of Environmental Indicators for Environmental Performance Reviews - Synthesis Report by the Group on the State of the Environment*, Paris

OECD (1994), *Environmental Indicators - OECD Core Set*, Paris.

OECD (1994), *Natural Resource Accounts: Taking Stock in OECD Countries,* Paris.

OECD (1995), *Environmental Accounting for Decision-making — Summary Report of an OECD Seminar*, Paris.

OECD (1995) *Motor Vehicle Pollution : Reduction Strategies beyond 2010*, Paris.

OECD (1996) *Environmental Criteria for Sustainable Transport*, Paris.

OECD (1996) *Environmental Performance in OECD countries - Progress in the 1990s*, Paris

OECD (1997) *Transport and Environment*, Paris.

OECD (1997) *Environmental Data Compendium 1997*, Paris.

OECD (1997), *Reforming Energy and Transport Subsidies: Environmental and Economic Implications* , Paris

OECD (1998) *Scenarios for Environmentally Sustainable Transport*, Report on Phase 2 of the EST project, Paris.

OECD (1998) *Towards Sustainable Development - Environmental Indicators*, Paris.

OECD (1999) *Environmental Data Compendium 1999*, Paris.

OECD (since 1993), *Environmental Performance reviews*, four reviews per year, Paris
[reviews including a transport chapter: France, Germany, Hungary, Italy, Japan, Korea, Netherlands, Portugal, Spain, Switzerland, USA]

UN-ECE *Transport Statistics - for Europe and North America*, New York, various issues.